



**UNITED STATES ARMY
ENVIRONMENTAL HYGIENE
AGENCY**

ABERDEEN PROVING GROUND, MD 21010

**A
E
H
A**

HAZARD ANALYSIS OF BROAD-BAND OPTICAL SOURCES

THIRD EDITION

Approved for public release; distribution unlimited.

This technical guide was compiled by:

WESLEY J. MARSHALL
Physicist
Laser Microwave Division

DAVID H. SLINEY
Chief, Laser Branch
Laser Microwave Division

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

CONTENTS

Paragraph	Page
1. BACKGROUND -----	1
2. REQUIRED RADIOMETRIC DATA -----	1
3. MEASUREMENT TECHNIQUES -----	2
4. SPECTRAL HISTOGRAM -----	2
5. PROCESSING OF DATA -----	2
6. ABSOLUTE VERSUS RELATIVE SPECTRAL IRRADIANCE MEASUREMENTS -----	4
7. SPECTRAL RADIANCE MEASUREMENTS -----	4
8. BIOLOGICAL WEIGHTING FUNCTIONS -----	4
a. Ultraviolet Radiation (200-400 nm) -----	4
b. Visible Radiation (400-770 nm) and Near-Infrared Radiation (770-1400 nm) -----	5
c. Infrared Exposure (770 nm to 1 mm) -----	12
9. AMBIENT LIGHT LEVELS -----	13
10. REFERENCES -----	13

APPENDIX

A - Program Description -----	A-1
B - Computer Listing -----	B-1
C - Operating Instructions -----	C-1
D - Useful CIE Radiometric and Photometric Terms and Units -----	D-1



DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

REPLY TO
ATTENTION OF

HSE-RL/WP Technical Guide

September 1981

HAZARD ANALYSIS OF BROAD-BAND OPTICAL SOURCES

This technical guide provides an explanation of the techniques used by the Laser Branch, Laser Microwave Division, US Army Environmental Hygiene Agency, to evaluate nonlaser optical sources. Hazard criteria and spectral data reduction techniques are explained. Radiometric measurements are not included. The Laser Microwave Division Spectral Weighting Program (LMDSWP)--a Fortran V computer program--is presented in detail.



DEPARTMENT OF THE ARMY
U. S. ARMY ENVIRONMENTAL HYGIENE AGENCY
ABERDEEN PROVING GROUND, MARYLAND 21010

REPLY TO
ATTENTION OF

HSE-RL/WP Technical Guide

September 1981

HAZARD ANALYSIS OF BROAD-BAND OPTICAL SOURCES*

1. BACKGROUND.

a. The Laser Branch Microwave Division, US Army Environmental Hygiene Agency (USAEEHA), evaluates hazards from not only lasers, but also broad-band optical sources. Examples of such sources include searchlights, infrared missile guidance systems, optical beacons and hospital ultraviolet lamps. This guide explains the techniques used to reduce spectroradiometric measurements of such sources. To evaluate a broad-band optical source such as an arc, a lamp or an array of lamps as are found in hospital, military and industrial equipment, it is necessary to determine the spectral distribution of the optical radiation. The spectral distribution of interest is that of the accessible emission, which may differ from that of the open arc or lamp due to filtration by a plastic or glass window or by other optical elements in the system. The final hazard analysis of an optical source requires the weighted sum of several spectroradiometric parameters to estimate total retinal irradiance and biologically weighted corneal and skin irradiance. How these weighted sums are evaluated is explained in detail in "The Evaluation of Optical Radiation Hazards" by D. H. Sliney and B. C. Freasier, Applied Optics, Volume 12, pages 1-24, January 1973 (reference 10d). Ultraviolet radiation exposure limits are provided in AR 40-46, Control of Health Hazards from Lasers and Other High Intensity Optical Sources, 6 February 1974.

b. During 1976-1977, a computer program--The Laser Microwave Division Spectral Weighting Program (LMDSPW)--was developed by the Data Processing and Information Management Branch of USAEEHA and is explained in this guide in Appendix A. Appendix B provides a program listing and a table of values and plots for the spectral weighting functions. Appendix C provides operating instructions for using the program.

2. REQUIRED RADIOMETRIC DATA. The spectral irradiance E_λ should be complete from 200 nm to at least 1400 nm. For fluorescent lamps and many arc lamps, little infrared radiation beyond 1200 nm exists and can be neglected if instrument capability is limited to 1200 nm. The spectral irradiance E_λ at the nearest point of access (usually at the glass cover) is of interest in assessing potential ultraviolet hazards to the skin and eye, and potential hazards to the skin from the entire spectrum. The spectral radiance L_λ is of interest for assessing potential hazards to the retina and should be complete

* This Technical Guide supersedes the 10 March 1980 publication.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

from 400 to 1400 nm (the retinal hazard region). Again, the actual measurements beyond 1200 nm can generally be neglected. The values of L_λ may be closely estimated from E_λ values and source dimensions. Radiometric quantities are defined in Appendix D.

3. MEASUREMENT TECHNIQUES. The spectrum of an open arc process (e.g., welding arc), an arc lamp, a gas discharge lamp or a fluorescent lamp, consists of line structure plus a continuum. Significant errors can be made in representing the spectrum and weighting the spectrum against a biological action spectrum if the fraction of energy in each line is not properly added to the continuum. The first panel of Figure 1 shows a hypothetical spectral recording from a spectroradiometer. If spectral points were arbitrarily recorded every 5 nm, most of the line-peak recordings would be missed. The width of the triangular line at half of the peak is called the bandwidth of the monochrometer/spectroradiometer. The recommended method for representing the spectrum in tabular form is to provide the measured spectral irradiance [$\mu\text{W}/(\text{cm}^2 \cdot \text{nm})$] of the continuum at regular intervals (typically every 5 nm) and then list separately the irradiance ($\mu\text{W}/\text{cm}^2$) in each line. The latter values are determined by subtracting the continuum spectral irradiance at the spectral line from the peak reading and multiplying that value by the bandwidth of the monochrometer (typically 2 to 5 nm). These line irradiances are listed separately.

4. SPECTRAL HISTOGRAM. For graphical illustrations, the continuum and line structure are recombined by the computer program into a histogram. The spectral divisions of the histogram most accurately present the spectral resolution of the data. If the spectrum is represented in 5-nm intervals, the irradiance of each line is divided by 5 nm and added to the continuum spectral irradiance value in that 5-nm interval in which the emission line is located. As an example, we may wish to represent the spectrum of a mercury arc by having points at 300 nm, 305 nm, 310 nm, 315 nm, etc. The 5-nm band centered at 305 nm (i.e., 302.5 to 307.5 nm) contains the 303-nm emission line of mercury; likewise, the band centered at 315 nm contains the 313-nm emission line. Since the band centered at 310 nm contains no emission line of mercury, it truly represents only the continuum. Panel 3 of Figure 1 illustrates a histogram plot.

5. PROCESSING OF DATA. Many of the calculations which are useful in hazard analysis require weighting the spectrum against a biological action spectrum (e.g., erythema or photokeratitis action spectrum, the photopic response of the eye, and the retinal-injury action spectrum). The LMDSWP computer program (Appendix B) was developed to simplify this data reduction. Normally, there is little error introduced by using the digitized spectral irradiance values listed in the histogram plot for this process. However, if the lamp spectrum is changing rapidly at the same location where the weighting spectrum undergoes a rapid change, significant errors can be

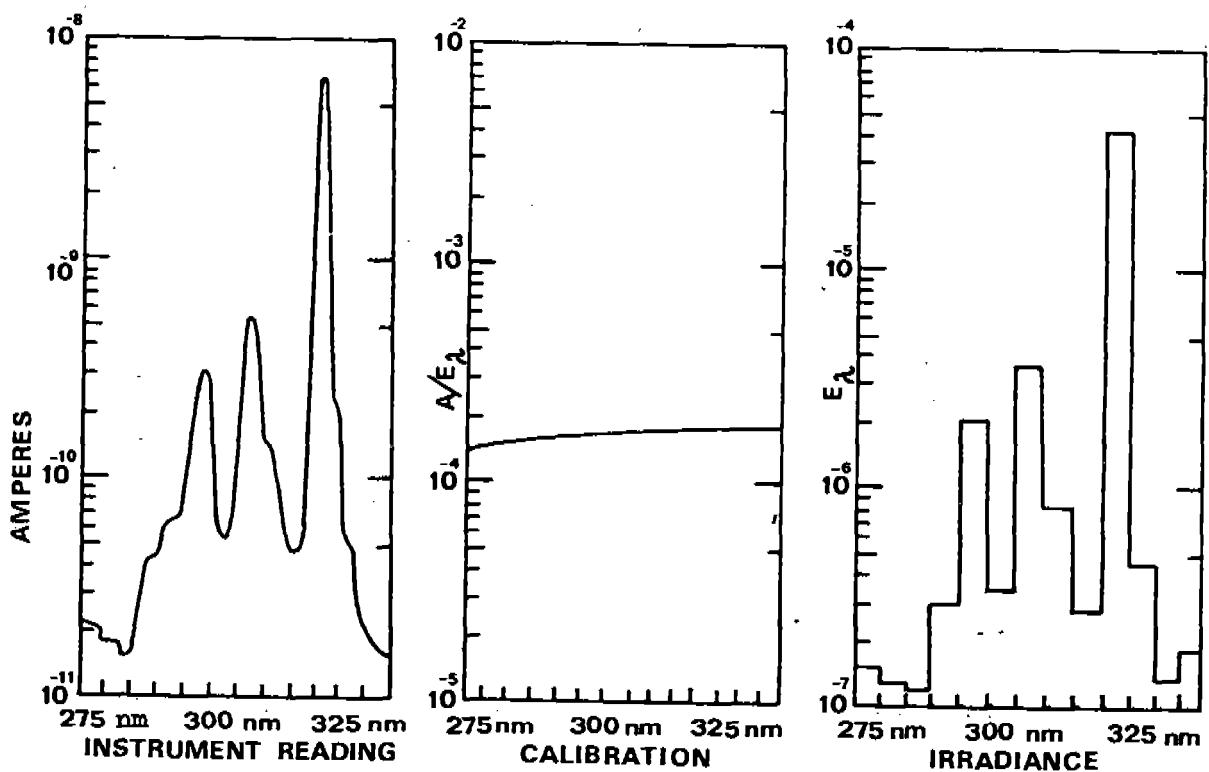


Figure 1. Hypothetical Spectral Data Reduction. The instrument reading is divided by the calibration factor to yield the spectral irradiance.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

introduced. It is, therefore, preferable to weight the line values separately when one type of lamp is routinely evaluated. The mercury lines (254, 297, 303, 313, 365, 405, 435 nm, etc.) are found not only in mercury lamps but also in fluorescent lamps. Routine hand-computing techniques and the machine-computing routine separately weight the continuum and line structure and then adds them afterward.

6. ABSOLUTE VERSUS RELATIVE SPECTRAL IRRADIANCE MEASUREMENTS. Absolute spectral irradiance or spectral radiance measurements are not always essential. Photometric-to-radiometric conversion factors (lumen/watt ratios) can be obtained from a relative spectrum of the lamp taken at any accessible location. Provided that luminance and illuminance measurements are made at a point of interest, the absolute spectroradiometric values can be calculated. This latter approach is often preferable since illuminance (lm/cm^2) and luminance (cd/cm^2) measurements can be made rapidly at many accessible points of interest. Provided that the spectrum does not change from one point to another, the ultraviolet-radiation hazard and retinal-injury hazard can be calculated at all such points. Because of the limits of sensitivity introduced by photocathode noise in typical spectroradiometers, it is often not possible to obtain spectral irradiance values at some distance from the source. This problem is particularly acute in the near infrared beyond 1000 nm. By measuring the relative spectral irradiance as near to the source as possible, this problem can be greatly reduced. The LMDSWP computer program calculates a lumen-to-watt conversion factor.

7. SPECTRAL RADIANCE MEASUREMENTS. The spectral radiance $L_\lambda [\mu W/(cm^2 \cdot sr \cdot nm)]$ is the spectral irradiance E_λ at a point of measurement divided by the solid angle of the source. It is typical to measure E_λ from one bright spot on the source. This can be accomplished by using an irradiance meter with a very small field-of-view or by occluding all but a small portion of the source with a mask. The solid angle of the source then becomes the exposed area of the source A_s divided by the square of the distance r from this area to the instrument:

$$L = E/\Omega_s \quad \text{and} \quad \Omega_s = A_s/r^2 \quad (1)$$

8. BIOLOGICAL WEIGHTING FUNCTIONS. Several potential hazards must be evaluated separately for different spectral bands, and biological weighting functions must be employed for this purpose.

a. Ultraviolet Radiation (200-400 nm). The potential hazards associated with ultraviolet radiation exposure of the eye and skin must be considered in each of two spectral regions. These regions are the actinic (or UV-B and UV-C) region, where photokeratitis, conjunctivitis (as with "welder's flash") and erythema (as with "sunburn") are the health hazards associated with this

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

form of radiation exposure; and the near ultraviolet (UV-A) spectral region, where the effects are not well known, but corneal injury and lenticular cataractogenesis has been suggested. Cataractogenesis may also result from UV-B.

(1) Actinic UV. Standards for exposure to the eye and skin developed at USAEHA and now recommended by both the American Conference of Governmental Industrial Hygienists (ACGIH) and the National Institute of Occupational Safety and Health (NIOSH) of the US Department of Health, Education, and Welfare have generally become accepted in the USA--particularly where ocular exposure is of concern (references 10a-10c). The limit for exposure is based upon an "envelope" action spectrum for photokeratitis and erythema. The spectrum from the source at the nearest accessible point is weighted by this curve (Figure 2 and Table 1) for wavelengths less than 318 nm.

The weighting formula is: $E_{eff} = \sum E_\lambda \cdot S_\lambda \cdot \Delta_\lambda$ (2)

and the permissible 8-hour limit for exposure is 10^{-7} W/cm² for E_{eff} (a total corresponding to an exposure dose of 3 mJ/cm²).

(2) Near-Ultraviolet Radiation. Criteria for limiting personnel exposure to UV-A radiation (320-400 nm) are presently based upon limited biological data. The solar irradiance incident upon the skin of an individual out-of-doors is normally 1-4 mW/cm². The level of 1 mW/cm² is often used as a safe exposure limit (references 10a - 10d). Summing the spectral irradiance, E_λ , from 320 to 400 nm, one obtains the total irradiance in the UV-A.

b. Visible Radiation (400-770 nm) and Near-Infrared Radiation (770-1400 nm).

(1) Blue Light Hazard. The exact boundaries for light (or "visible radiation") are often argued; at present, the International Commission on Illumination (CIE) sets 380-400 nm to 760-780 nm as "visible." However, of principal interest in most USAEHA special studies, is the effect of all radiation from 400 to 1400 nm that reach the retina. Except for small children and aphakics (those with the crystalline lens removed by cataract surgery), so little UV-A radiation reaches the retina that retinal exposure in that spectral region is considered insignificant. Until recently, retinal injury from high-intensity light sources was thought to be thermal injury to retinal tissue. In the past few years, it has become increasingly evident

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

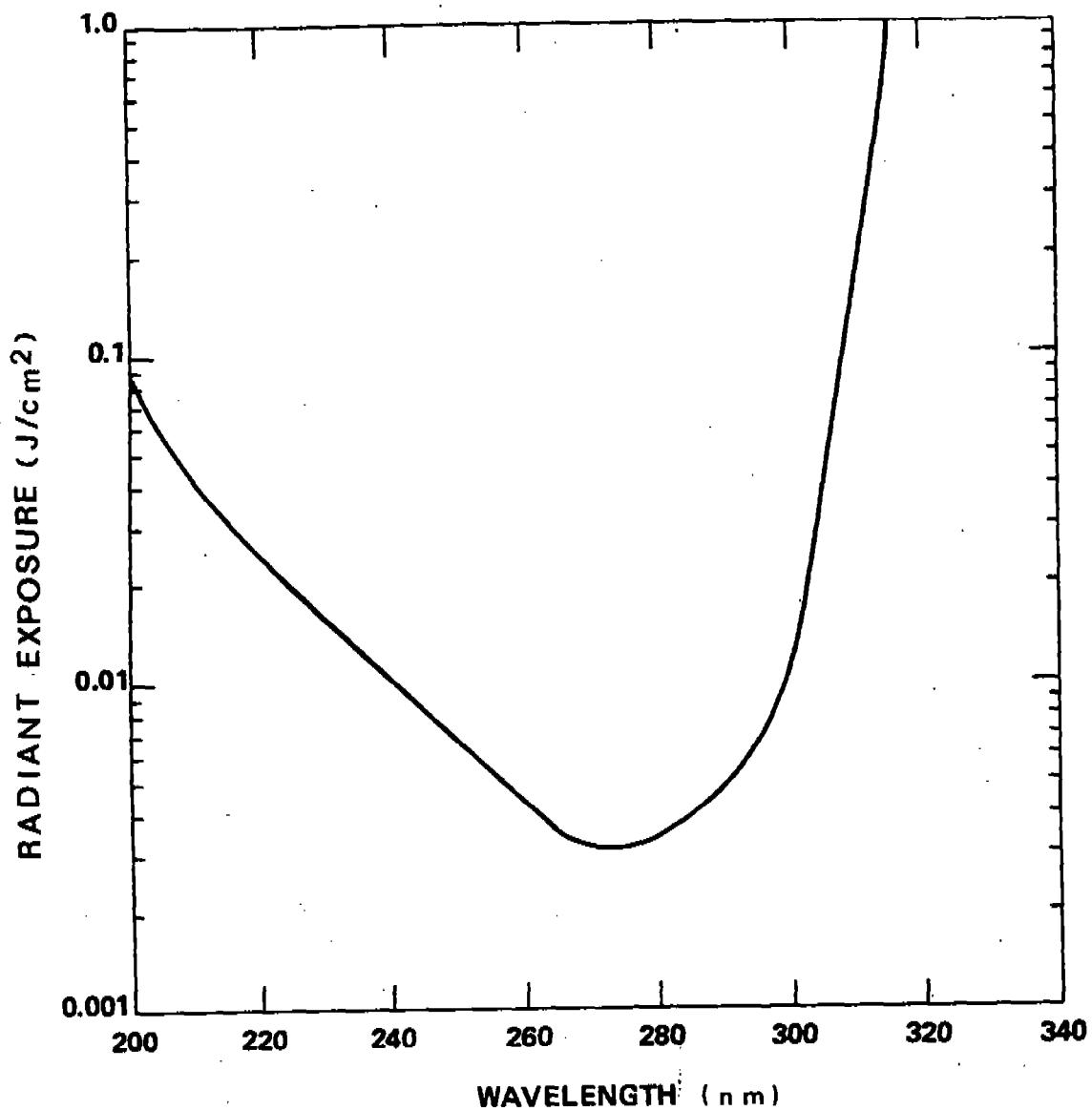


Figure 2. Recommended Ultraviolet Radiation Exposure Standard.
This figure was adapted from a figure developed and published by the American Conference of Governmental Industrial Hygienists in "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1981."

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

TABLE 1. RELATIVE SPECTRAL EFFECTIVENESS BY WAVELENGTH

Wavelength (nm)	TLV® (mJ/cm²)*	Relative Spectral Effectiveness S_λ
200	100	0.03
210	40	0.075
220	25	0.12
230	16	0.19
240	10	0.30
250	7.0	0.43
254	6.0	0.5
260	4.6	0.65
270	3.0	1.0
280	3.4	0.88
290	4.7	0.64
300	10	0.30
305	50	0.06
310	200	0.015
315	1000	0.003

® TLV - Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1981.

* 1 mJ/cm² = 10^{-3} J/cm²

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

that a photic effect which has as its basis a photochemical (e.g., phototoxic) reaction is responsible for threshold light-induced retinal injury for exposure durations exceeding 10 seconds (references 10d - 10g). The blue-light wavelengths near 440 nm appear to be by far the most hazardous. Although laser safety standards reflect a photochemical injury hypothesis for light exposures greater than 10 seconds, they were initially based on very little data available at the time of their development--1973 (references 10d and 10h). For the purpose of evaluating noncoherent, broad-band sources, it is more reasonable to develop a standard for lamp exposures directly from the threshold retinal injury data. A blue-light hazard function, B_λ , was developed at USAEHA from the data of Ham and is given in Table 2. It has since been proposed as a possible future TLV by ACGIH.

(2) Retinal Exposure. To consider a retinal injury safety standard, we must first define the relation between retinal levels and lamp brightness (or radiance). The retinal irradiance E_r is related to the source radiance L_s that is being directly viewed and is independent of viewing distance. It is also influenced by the transmission τ of the ocular media in front of the retina and upon the pupil diameter d_e , which for a bright visible source is normally less than 3 mm. The relation is:

$$E_r = 0.27 L_s \cdot \tau \cdot d_e^2 \quad (3)$$

This equation may be used to calculate the retinal irradiance at just one wavelength or in a narrow wavelength band (e.g., blue light), or it may be used to calculate the total retinal irradiance from 400 to 1400 nm. In the latter case, the spectral radiance distribution L_λ must be weighted against the spectral transmittance of the ocular media τ to obtain an average or effective transmittance of the ocular media, τ_{eff} (reference 10d). The formula is:

$$\tau_{eff} = \sum_{\lambda} L_{\lambda} \cdot \tau \cdot \Delta\lambda / \sum_{\lambda} L_{\lambda} \cdot \Delta\lambda \quad (4)$$

(3) Photometric Values. The source brightness can also be considered in photometric terms.

The luminance L_v of the source is found by:

$$L_v = 683 \sum_{\lambda} V_{\lambda} \cdot L_{\lambda} \cdot \Delta\lambda \quad (5)$$

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

TABLE 2. SPECTRAL WEIGHING FUNCTIONS FOR ASSESSING RETINAL HAZARDS FROM BROAD-BAND OPTICAL SOURCES

Wavelength (nm)	Blue-Light Hazard Function B_λ	Burn Hazard Function R_λ
400	0.10	1.0
405	0.20	2.0
410	0.40	4.0
415	0.80	8.0
420	0.90	9.0
425	0.95	9.5
430	0.98	9.8
435	1.0	10.0
440	1.0	10.0
445	0.97	9.7
450	0.94	9.4
455	0.90	9.0
460	0.80	8.0
465	0.70	7.0
470	0.62	6.2
475	0.55	5.5
480	0.45	4.5
485	0.40	4.0
490	0.22	2.2
495	0.16	1.6
500-600	$10^{[(450-\lambda)/50]}$	1.0
600-700	0.001	1.0
700-1049	0.001	$10^{[(700-\lambda)/500]}$
1050-1400	0.001	0.2

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

Using this formula and the CIE luminous efficiency function V_λ which has a maximal value of 1.0 at 550 nm where the radiometric-to-photometric conversion factor is 683 lumens/watts, from formula (5) the luminance is calculated. Following the same approach for total illuminance E_V at the point where E_λ was measured is:

$$E_V = 683 \sum V_\lambda \cdot E_\lambda \cdot A_\lambda \quad (6)$$

These formulae also permit one to calculate the luminous efficacy of radiation from the lamps in lumens/watts. If the spectrum is weighted against the scotopic (rod) response functions V_λ , we then obtain the scotopic efficiency, where the maximal value would be 1.0 at 500 nm (the peak response of rods). The constant in Equation (6) is not 683 for scotopic vision calculations. Although photometric quantities are not normally used solely for comprehensive hazard evaluation, many relatively inexpensive measuring instruments may be used as a crosscheck on radiometrically measured values. Furthermore, cosine-corrected photometric instruments may be used to cosine-correct spectrally measured UV data.

(4) Exposure Limits. Simplified standard limits developed at USAEHA and also proposed as a future TLV by ACGIH for broad-band light sources provide the following limits expressed in terms of the source radiance.

(a) To protect against retinal thermal injury, the spectral radiance of the lamp weighted against the function R_λ (Table 2) should not exceed:

$$L_{(HAZ)} = \frac{1}{\alpha t^{1/2}} \quad (7)$$

where L is in $\text{W}/(\text{cm}^2 \cdot \text{sr})$ and t is the viewing duration (or pulse duration if the source is pulsed) limited from 1 ms to 10 seconds, and α is the angular subtense of the source in radians. If the source is oblong (e.g., a tubular flash lamp), the angle α refers to the longest dimension. For instance, at a viewing distance $r = 100$ cm from a xenon flash lamp of length $\ell = 50$ cm the approximate viewing angle α is:

$$\alpha = 2[\arctan (\ell/2r)]$$

or:

$$\begin{aligned} \alpha &\approx \ell/r \text{ for small } \alpha \\ &\approx 50/100 = 0.5 \text{ radian} \end{aligned} \quad (8)$$

This relationship may also be expressed in retinal terms; e.g., irradiance and image diameter. The USAEHA retinal hazard function is graphed in Figure 3.

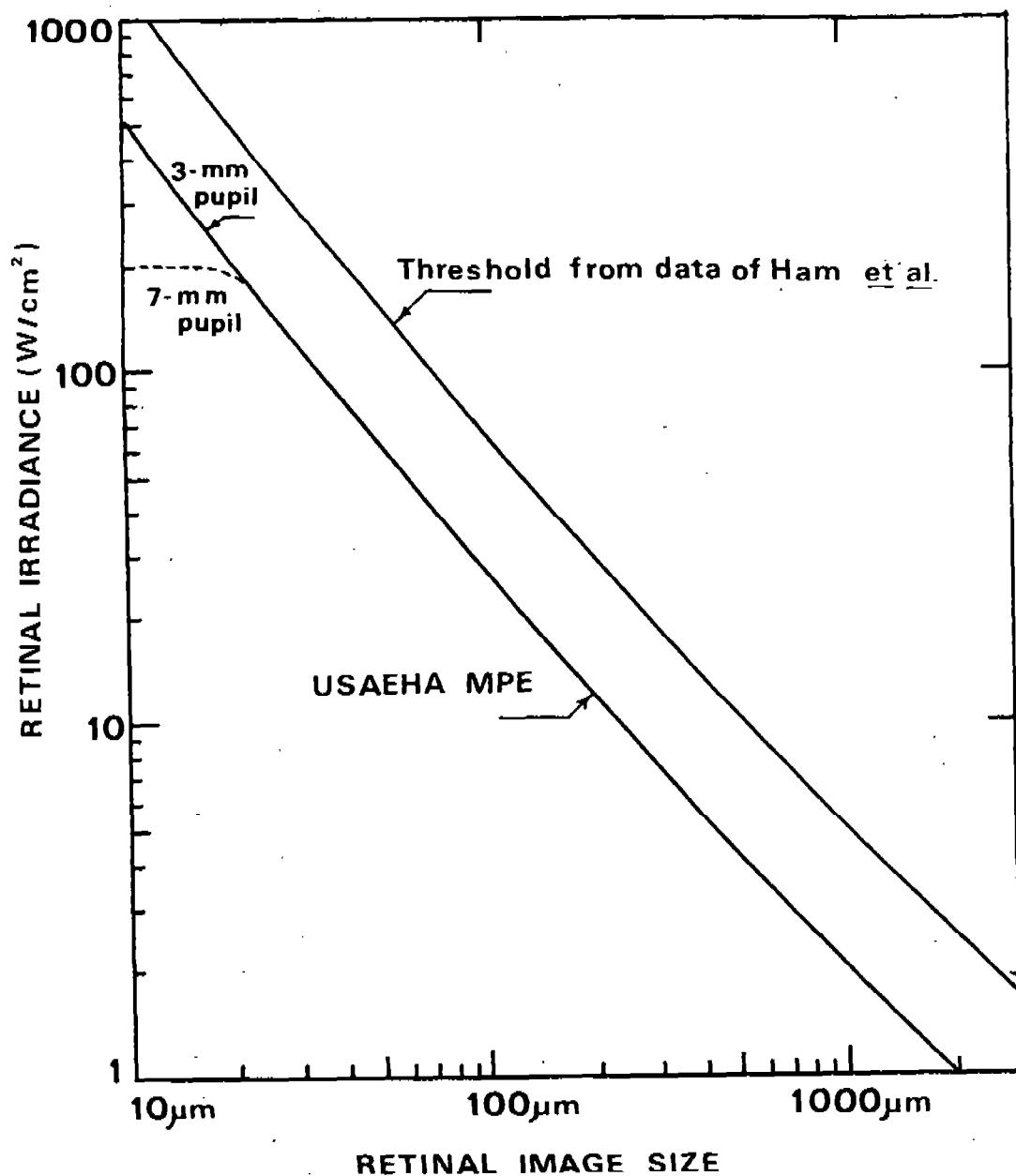


Figure 3. USAEHA Permissible Retinal Irradiance for Momentary Viewing of Extended Sources as a Function of Retinal Image Size.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

(b) To protect against retinal injury from blue-light exposure, the integrated spectral radiance of the lamp weighted against the blue-light hazard function B_λ (Table 2) is termed L (blue) and should not exceed:

$$\begin{aligned} L_p(\text{HAZ}) &= 100 \text{ J}/(\text{cm}^2 \cdot \text{sr}) \text{ for } t < 10^4 \text{ seconds} \\ L(\text{HAZ}) &= 10 \text{ mW}/(\text{cm}^2 \cdot \text{sr}) \text{ for } t > 10^4 \text{ seconds} \end{aligned} \quad (9)$$

For a source radiance L which exceeds $10 \text{ mW}/(\text{cm}^2 \cdot \text{sr})$ in the blue region, the permissible exposure duration t (max) in seconds is simply:

$$t (\text{max}) = 100 \text{ J}/(\text{cm}^2 \cdot \text{sr}) / L (\text{blue}) \quad (10)$$

These latter limits are greater than maximum permissible exposure limits for 440-nm laser radiation (AR 40-46 and ANSI Z-136.1), because a 2-3 mm pupil is assumed rather than a 7 mm pupil for the Laser TLV. For a light source subtending an angle α less than 11 mrad (0.011 radian) the above limits are relaxed such that the spectral irradiance weighted against the blue-light hazard function B_λ should not exceed:

$$\sum_{400}^{1400} E_\lambda \cdot t \cdot B_\lambda \cdot \Delta\lambda \leq 10 \text{ mJ} \cdot \text{cm}^{-2} \quad (t \leq 10^4 \text{ s}) \quad (11)$$

$$\sum_{400}^{1400} E_\lambda \cdot B_\lambda \cdot \Delta\lambda \leq 1 \text{ W} \cdot \text{cm}^{-2} \quad (t > 10^4 \text{ s}) \quad (12)$$

For a source where the blue light weighted irradiance E (blue) exceeds $1 \text{ W} \cdot \text{cm}^{-2}$ the maximum permissible exposure duration t max in seconds is:

$$t \text{ max} = 10 \text{ mJ} \cdot \text{cm}^{-2} / E (\text{blue}) \quad (13)$$

c. Infrared Exposure (770 nm to 3000 nm). The total accessible average irradiance in the infrared from most sources should be kept below $10 \text{ mW}/\text{cm}^2$. This value is to protect against either retinal injury or cataractogenesis (reference 10d). The IR-A radiance should be less than

$$\sum_{770}^{3000} E_\lambda \Delta\lambda = 0.6/\alpha \quad (14)$$

for extended duration viewing conditions. This limit is based upon a 7-mm pupil diameter.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

9. AMBIENT LIGHT LEVELS. It is often considered useful to compare the spectral radiance of a lamp to the same spectral radiance of natural light sources. Figure 4 is a plot of spectral radiance of the solar disc ($\Omega_s = 6.9 \times 10^{-5} \text{ sr}$) and of an average blue-sky condition. To calculate the spectral radiance of snow at noonday, divide the uppermost curves by 50,000. For example, the approximate noonday spectral radiances at 440 nm are (from Figure 4):

Sun: $1.3 \text{ W}/(\text{cm}^2 \cdot \text{sr} \cdot \text{nm})$

Snow: $2.6 \times 10^{-5} \text{ W}/(\text{cm}^2 \cdot \text{sr} \cdot \text{nm})$

Sky: $7 \times 10^{-6} \text{ W}/(\text{cm}^2 \cdot \text{sr} \cdot \text{nm})$

Until a thorough understanding of chronic exposure hazards to the eye has developed, one should be concerned about ocular exposures to the levels exceeding those of the latter two sources for long periods of time (reference 10i).

10. REFERENCES.

- a. American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment with Intended Changes for 1981," ACGIH, Cincinnati, OH (1981)
- b. National Institute of Occupational Safety and Health, "Criteria for a Recommended Standard, Occupational Exposure to Ultraviolet Radiation," US Department of Health, Education, and Welfare, Washington, DC (1972)
- c. Sliney, D. H., "The Merits of an Envelope Action Spectrum for Ultraviolet Exposure Criteria," Amer Indust Hyg Assn J 33(10):644-653 (October 1972)
- d. Sliney, D. H. and B. C. Freasier, "The Evaluation of Optical Radiation Hazards," Appl Opt, 12(1):1-24 (January 1973)
- e. Harwerth, R. S. and H. G. Sperling, "Prolonged Color Blindness Induced by Spectral Lights in Rhesus Monkeys," Science, 174(4008):520-522 (29 October 1971)
- f. Lawwill, T., S. Crockett and G. Currier, "Retinal Damage Secondary to Chronic Light Exposure," Doc Ophthal, 44(2):379-402 (1977)

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

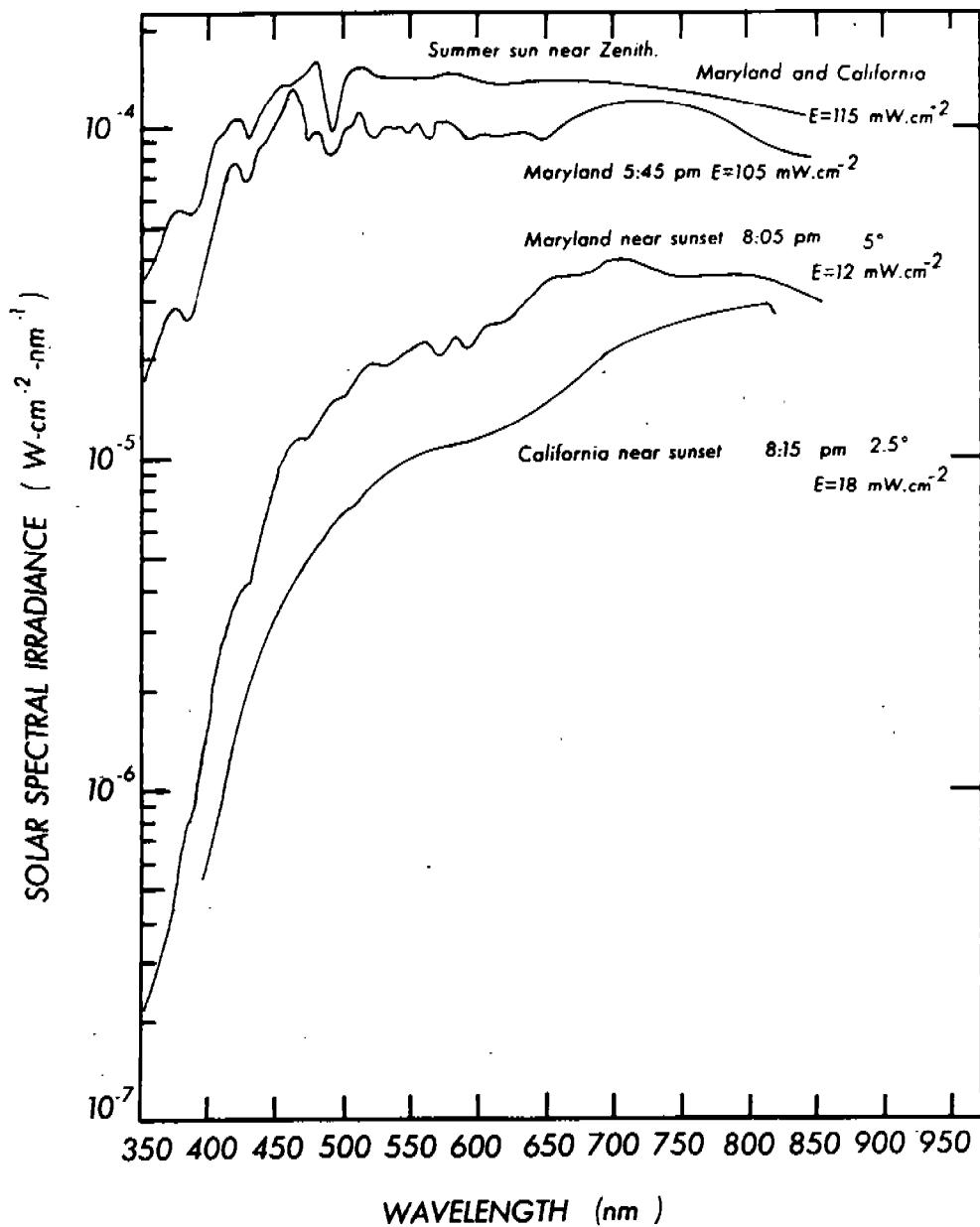


Figure 4. Spectral Radiance of the Summer Sun for Two Localities. Note the change in short-wavelength spectral irradiance as the sun approaches sunset.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

g. Ham, W. T., Jr., H. A. Mueller and D. H. Sliney, "Retinal Sensitivity to Damage from Short Wavelength Light," *Nature*, 260:153-155 (1976)

h. American National Standards Institute, "Safe Use of Lasers," Z-136.1, ANSI, New York, NY (1976)

i. Sliney, D. H., "The Ambient Light Environment and Ocular Hazards," in Retinitis Pigmentosa (eds. M. B. Landers, et al.), pp 211-221, Plenum, New York (1977)

j. Sliney, D. H. and M. L. Wolbarsht, "Safety with Lasers and Other Optical Sources," Plenum Publishing Corp, New York (1980)

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

APPENDIX A

PROGRAM DESCRIPTION

1. NAME OF PROGRAM. Laser Microwave Division Spectral Weighting Program (LMDSWP).
2. PROGRAM LANGUAGE. FORTRAN V (Exec 9 Run Stream).
3. PURPOSE. The purpose of LMDSWP is to create a spectral irradiance listing of a measured broad band source, provide a summary of physical properties of the source based on its spectrum, and to provide histogram plots of the spectral irradiance.
4. INPUT. The following items may be submitted as input to the program.
 - a. Project description - DESCRP (less than 30 words).
 - b. Calibration of the measuring instrument over three spectral regions - CF.
 - c. Corrections to the calibration - DFU and DFV.
 - d. Band pass of instruments over three spectral regions - BANPAS(3)
 - e. Separating wavelengths for three spectral regions - BWAV1, BWAV2
 - f. Source description - Event (several sources may be submitted under the same project).
 - g. Source Solid Angle - OMEGA.
 - h. Instrument readings - EINSTR.
 - i. Corrections to the instrument readings - FOFX.
 - j. Spectral transmissions of three filters - FT1, FT2, and FT3.
 - k. Calculation control card (see coding forms).
 - l. Biologic Data (see Table A-1).
5. OUTPUT. The output consists of four items: a description of the data input, a listing by wavelength of the spectral irradiance and related biological information, a summary of physical and biologic properties of the source determined from the spectrum, and a histogram plot of the source spectral irradiance. A description of the printed values is presented in Table A-1.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

TABLE A-1. BIOLOGIC DATA

<u>FUNCTION</u>	<u>FORTRAN NAME</u>	<u>DESCRIPTION</u>
V/E_e	VE	Radiant efficacy of radiation from λ min to λ max in lumens/watt; equals $(680 \sum_{\lambda} E_{\lambda} V_{\lambda} \Delta_{\lambda})/E_e$
V'/E_e	VIE	Fraction CIE scotopic radiation from λ min to λ max; equals $(\sum_{\lambda} E_{\lambda} V'_{\lambda} \Delta_{\lambda})/E_e$
$\sum E T/E_e$	TRANS	Effective transmission of ocular media from λ min to λ max; equals $(\sum_{\lambda} E_{\lambda} T_{\lambda} \Delta_{\lambda})/E_e$
	TRANTX	Effective transmission of ocular media multiplied by spectral absorption of ocular media; equals $\sum_{\lambda} (E_{\lambda} T_{\lambda} APE_{\lambda} \Delta_{\lambda})/E_e$
$E_e * R_{\lambda}$	EECA	ANSI Laser MPE weighting factor for visible and IR-A; equals $(\sum E_{\lambda} * R_{\lambda} \Delta_{\lambda})/E_e$
PCTUV		Percent of total irradiance between λ min and λ max which is UV radiation; equals $(100 \sum_{\lambda=400}^{400} E_{\lambda} \Delta_{\lambda})/E_e$
PCTVI		Percent of total irradiance which is visible radiation; equals $(100 \sum_{\lambda=405}^{700} E_{\lambda} \Delta_{\lambda})/E_e$
PCTNIR		Percent of total irradiance which is near-infrared radiation; equals $(100 \sum_{\lambda=705}^{\lambda_{\max}} E_{\lambda} \Delta_{\lambda})/E_e$

HSE-RL/WP Technical Guide
 Hazard Analysis of Broad-Band Optical Sources

<u>FUNCTION</u>	<u>FORTRAN NAME</u>	<u>DESCRIPTION</u>
B_λ	BLUHAZ	Blue-light hazard function weighted against spectral irradiance; equals $\sum E_\lambda B_\lambda \Delta_\lambda$
\bar{X}_λ	XBAR	CIE-1931 blue chromaticity coordinate weighted against spectral irradiance; equals $\sum E_\lambda \bar{X}_\lambda \Delta_\lambda$
\bar{Y}_λ	YBAR	CEI-1931 green chromaticity coordinate weighted against spectral irradiance; equals $\sum E_\lambda \bar{Y}_\lambda \Delta_\lambda$
\bar{Z}_λ	ZBAR	CIE-1931 red chromaticity coordinate weighted against spectral irradiance; equals $\sum E_\lambda \bar{Z}_\lambda \Delta_\lambda$
P-445	P445LB	Dartnall nomogram absorption coefficient for blue weighted against spectral irradiance
P-535	P535LB	Dartnall nomogram absorption coefficient for green weighted against spectral irradiance
P-575	P575LB	Dartnall nomogram absorption coefficient for red weighted against spectral irradiance.

HSE-RL/WP Technical Guide
 Hazard Analysis of Broad-Band Optical Sources

<u>FUNCTION</u>	<u>FORTRAN NAME</u>	<u>DESCRIPTION</u>
CF	CF	Calibration factor; equals (R_{vis}/E_{viscal}) (DFV) for 250-1400 nm or 300-1400 nm; equals (R_{uv}/E_{uvcal}) (DFU) for 200-300 nm
E_i	EINSTR	Instrument readings for corroboration of input data in amperes.
$E_i(fofx(\lambda))$	EIFOFX	Adjusted instrument readings; equals $E_i(fofx(\lambda))$
E_λ	ELAMBD	Spectral irradiance of source under study; equals $E_i(fofx(\lambda))/CF_\lambda$
L_λ	LLAMBD	Spectral radiance of source under study; equals E_λ/Ω
$E_\lambda \cdot F_\lambda(1)$	EFT	Spectral filter transmission for filter one; equals $(E_\lambda)(FT1)$
$E_\lambda \cdot F_\lambda(2)$	EFT	Spectral filter transmission for filter two; equals $(E_\lambda)(FT2)$
$E \cdot F(1,2)$	EFT	Spectral filter transmission for filter one and two together; equals $\Sigma E_\lambda(FT1)_\lambda(FT2)_\lambda$
$E_r(\lambda)$	ERETLB	Spectral retinal irradiance for 3-mm and 7-mm pupil; equals $0.27 (L_\lambda \cdot T_\lambda \cdot D_p^2)$
$X_\lambda \cdot E_\lambda$	GLAMBD	General weighting column; ability to choose any previous function X_λ in biodeck; equals $X_\lambda \cdot E_\lambda$

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

a. Data Input Description. This output provides all the information entered on the calculation control card, the number and type of filters used in conjunction with the optical source, the type of calibration deck used, and corrections used to modify the calibration or instrument readings.

b. Spectral Irradiance Listing. This output provides a listing by wavelength of the calibration factors, instrument readings, adjusted instrument readings, spectral irradiance, spectral radiance, spectral retinal irradiance, a choice of 15 biologic functions, and the spectrum weighted against the filter transmissions. These functions are tabulated in Table A-2. In addition, this same information is provided at the end for all spectral peaks.

c. Summary. The summary page lists the integrated spectral irradiance, radiance, illuminance, luminance, ultraviolet irradiance, blue-light irradiance, and several other important physical and biological properties of the optical source. If filters are used in the input, a summary sheet will be produced for each filter and if two filters are used, one for both filters used in series will be produced.

d. Histogram Plots. The spectral irradiance is plotted on both a linear and logarithmic scale. If filters are used in the input, a histogram plot of each filter and both filters together, when two filters are used, will also be plotted. Also, the specific biologic function listed spectrally (GENWEI) may be plotted if desired by proper entry on the calculation control card.

6. RUNSTREAM. Part or all of the following data must be entered in a run. (Instructions on the actual method of entering the data will appear in the operating instructions section.) The runstream is illustrated in Figures A-1 and A-2. Figures A-3, A-4, A-5, and A-6 are general and specific flowcharts of the SWP200 version of this program.

a. Run Stream Deck. This deck contains the run card, sets up the necessary files and executes the program.

b. Project Description. One or two cards of free formatted information.

c. Calculation Control Card. This card outlines the types of input that will follow for proper data entry and specifies which of 22 functions is to be selected for output spectral listing.

d. Calibration Deck. This deck consists of the following items:

(1) Distance Factor Card. This card contains the values, DFV and DFU, for adjusting the calibration deck for calibrations done at varying

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

TABLE A-2. VALUES OF GENWEI - SPECIFIC BIOLOGICAL FUNCTION WEIGHTED AGAINST
IRRADIANCE TO BE LISTED SPECTRALLY

<u>CODE</u>	<u>CALCULATION</u>
00	No calculation
01	$E-\lambda * S-\lambda$
02	$E-\lambda * U-\lambda$
03	$E-\lambda * A-\lambda$
04	$E-\lambda * T-\lambda$
05	$E-\lambda * T-A-\lambda$
06	$E-\lambda * C-A-\lambda$
07	$E-\lambda * V-\lambda$
08	$E-\lambda * V^*-\lambda$
09	$E-\lambda * B-\lambda$
10	$E-\lambda * X-\bar{\lambda}$
11	$E-\lambda * Y-\bar{\lambda}$
12	$E-\lambda * Z-\bar{\lambda}$
13	$E-\lambda * P-445$
14	$E-\lambda * P-535$
15	$E-\lambda * P-575$

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

RUNSTREAM - SWP200

```
@RUN SWP200
@ASG,A RK$LMDSW2.
@ASG,A LM$LMDSWP.
@DELETE,C SWP200$PLOT1.
@DELETE,C SWP200$PLOT2.
@ASG,UP SWP200$PLOT1.
@USE 20.,SWP200$PLOT1.
@ASG,UP SWP200$PLOT2.
@USE 15.,SWP200$PLOT2.
@ASG,T TEMP.
@USE 25.,TEMP.
@XQT RK$LMDSW2.SWP200
```

DESCRIPTION CARDS: You must have one or two project description cards.
Start the second card with a non-numeric symbol in column one.

(FORMAT: 13A6,A2 for each card)

CALCULATION CONTROL CARD:

<u>CARD COLUMN</u>	<u>ACRONYM</u>	<u>CHARACTER POSSIBILITIES</u>
1	NUMFIL	0,1,2
2	NOCOF1	0,1,2
3	NOCOF2	0,1,2
4	NOCOF3	0,1,2
5	CALDAT	0,1,2,3,4,5,6
6,7	GENWEI	00,01,...,22
8	GENFUN	0,1
9	FLPLOT	0,1
10	STORE	0,1,2,...,6
11	IOS	0,1
12	SUPRES	0,1
13	LINLOG	0,1,2
14	SUMRY	0,1

DISTANCE FACTOR CARD: Ultraviolet distance, visible distance, bandpass one, separation wavelength, bandpass two, separation wavelength, bandpass three.
(FORMAT: 7F4.0)

CALIBRATION HEADER AND CALIBRATION DATA: If CALDAT=2, then cal header and data not required.

BIODECK DATA: Use: @ADD LM\$LMDSWP.DATA

FILTER ONE DATA AND HEADER CARD: Only required if NUMFIL > 0

FILTER TWO DATA AND HEADER CARD: Only required if NUMFIL = 2 or 3

FILTER THREE DATA AND HEADER CARD: Only required if NUMFIL = 3

EVENT CARD, SOURCE SOLID ANGLE, INSTRUMENT READINGS: These may appear (IN THIS ORDER) more than once in the same run.

```
@MSG,W PLOT,SWP200,3932,(your name)
@PLOT,IW SWP200$PLOT1.,1
@ED,U TEMP., LM$LMDSWP.element
EXIT
@COPY,S LM$LMDSWP.element,LM$LMDSWP.element
@PACK LM$LMDSWP.
@FIN
```

} Use only when storing a deck on permanent file.

Figure A-1. Runsteam of SWP200 Version of the Laser Microwave Division Spectral Weighing Program.

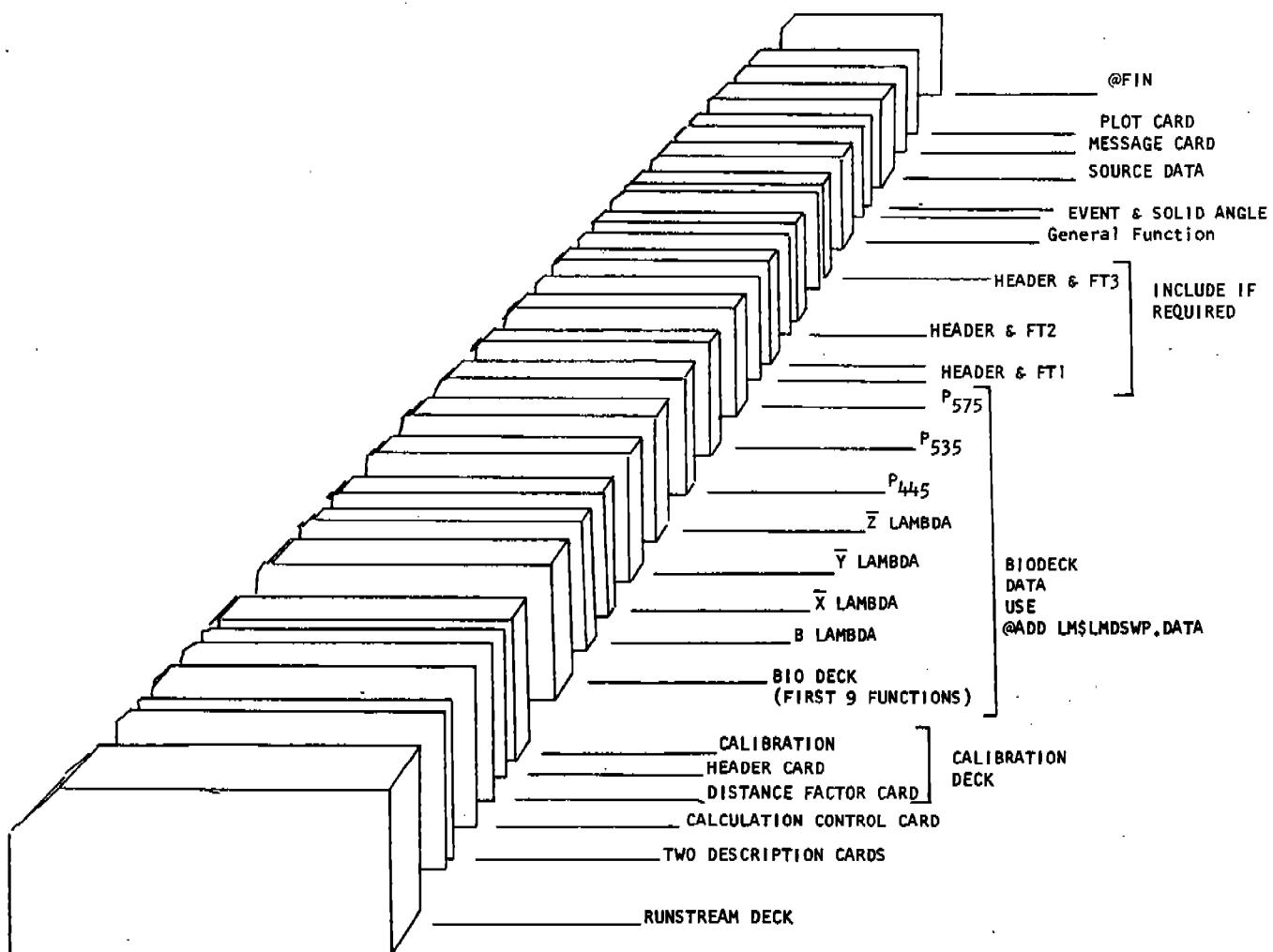


FIGURE A-2. SYMBOLIC REPRESENTATION OF SPECTRAL WEIGHTING PROGRAM RUNSTREAM.

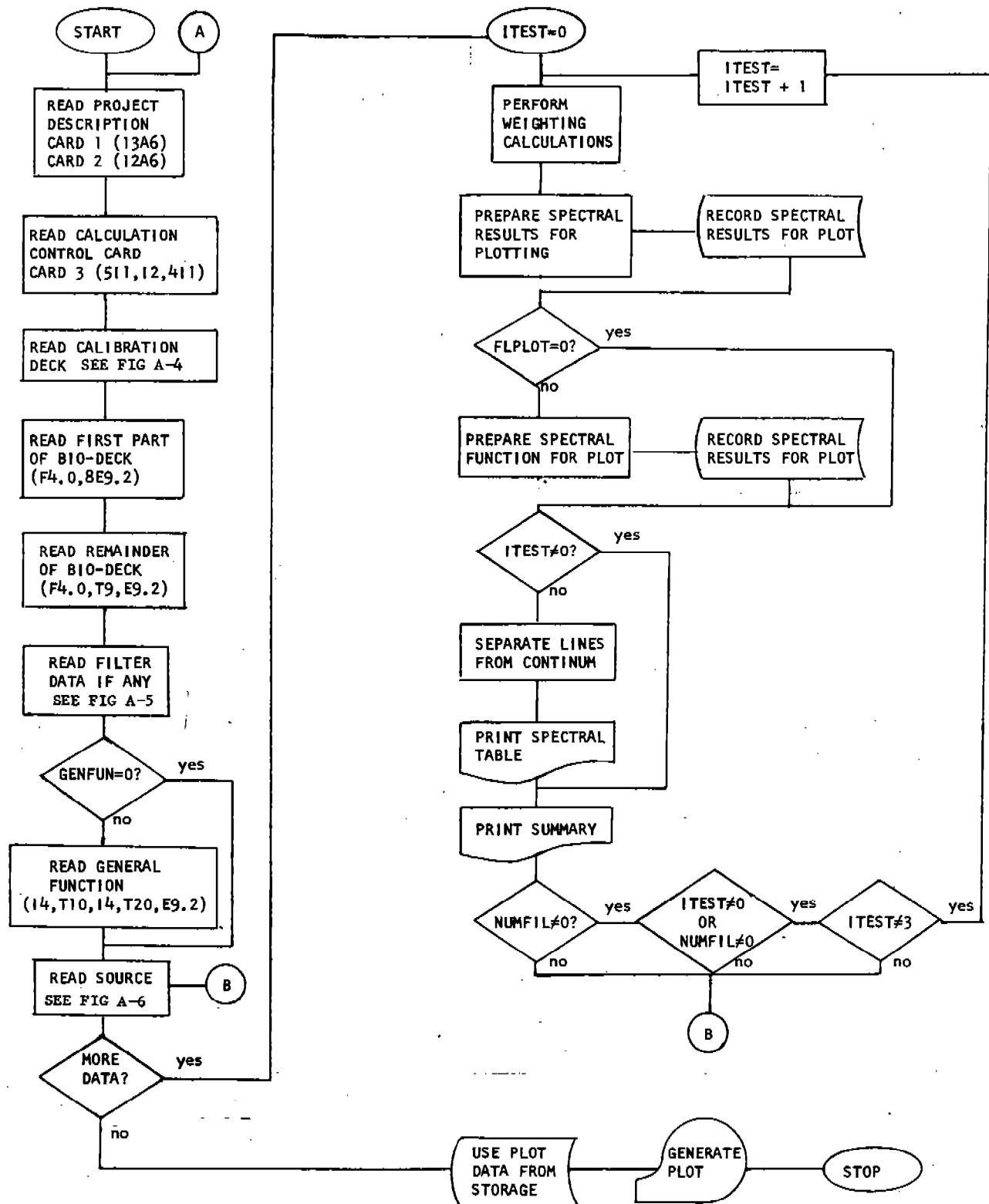


FIGURE A-3. GENERAL FLOWCHART OF SWP200 VERSION OF THE SPECTRAL WEIGHTING PROGRAM.

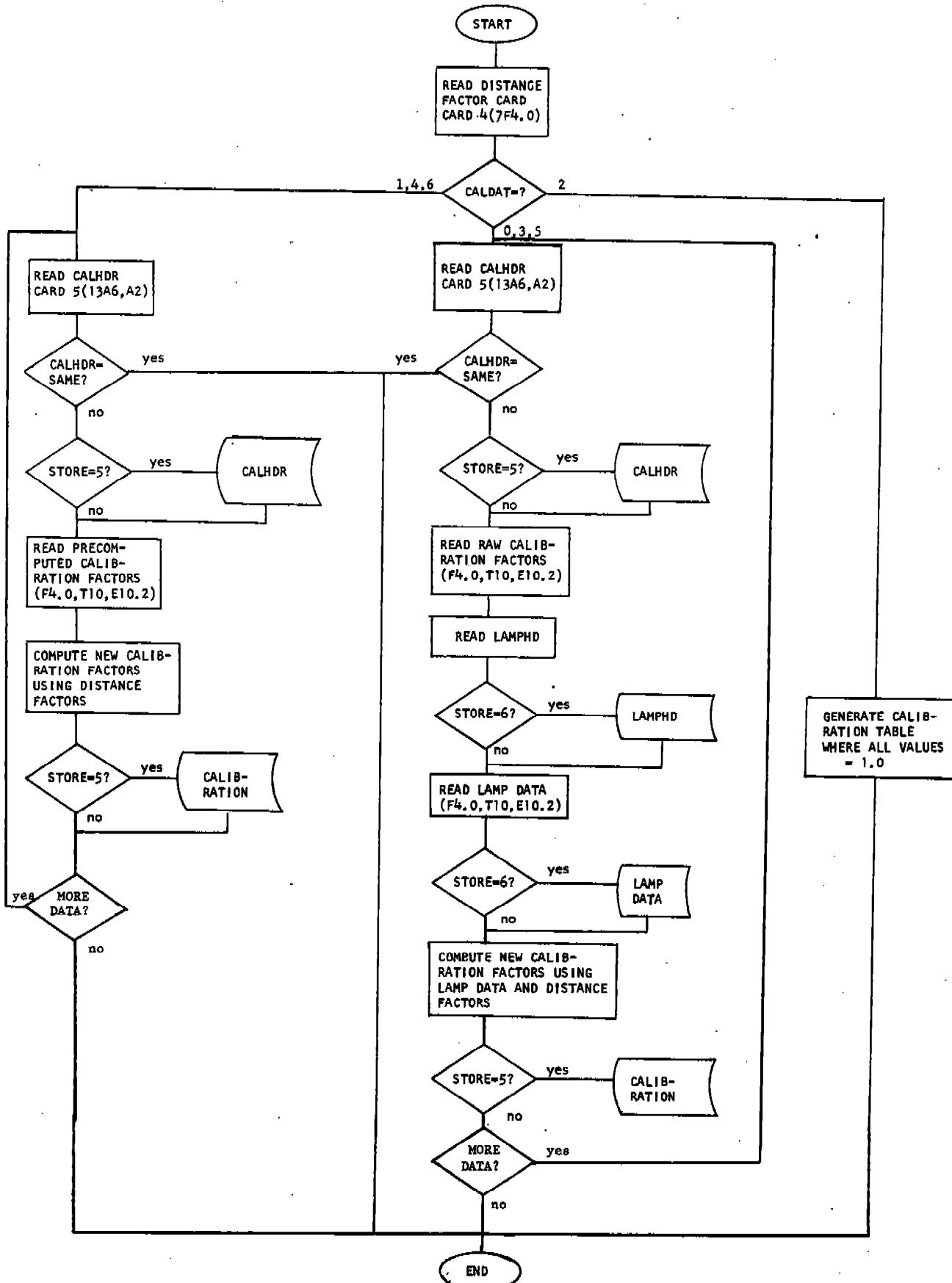


FIGURE A-4. EXPANDED FLOWCHART FOR COMPUTING CALIBRATION FACTORS

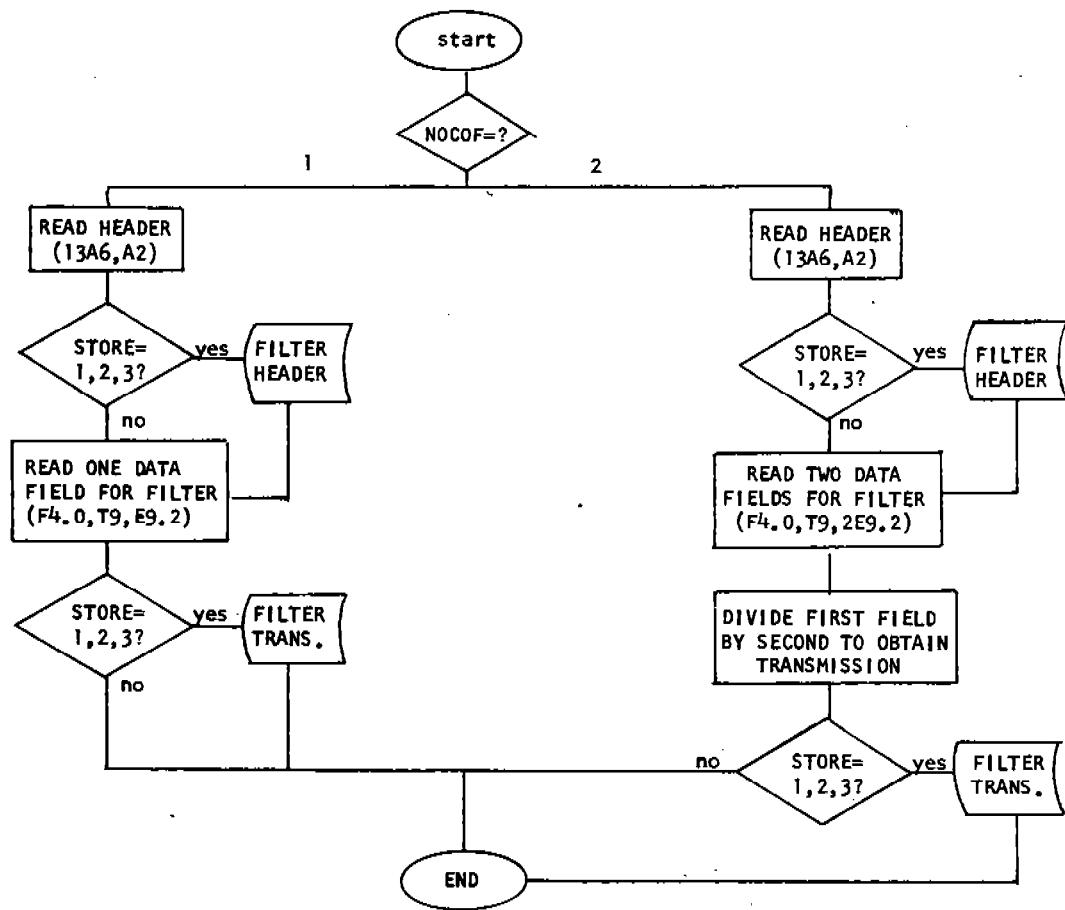


FIGURE A-5. EXPANDED FLOWCHART FOR READING FILTER TRANSMISSION DATA.

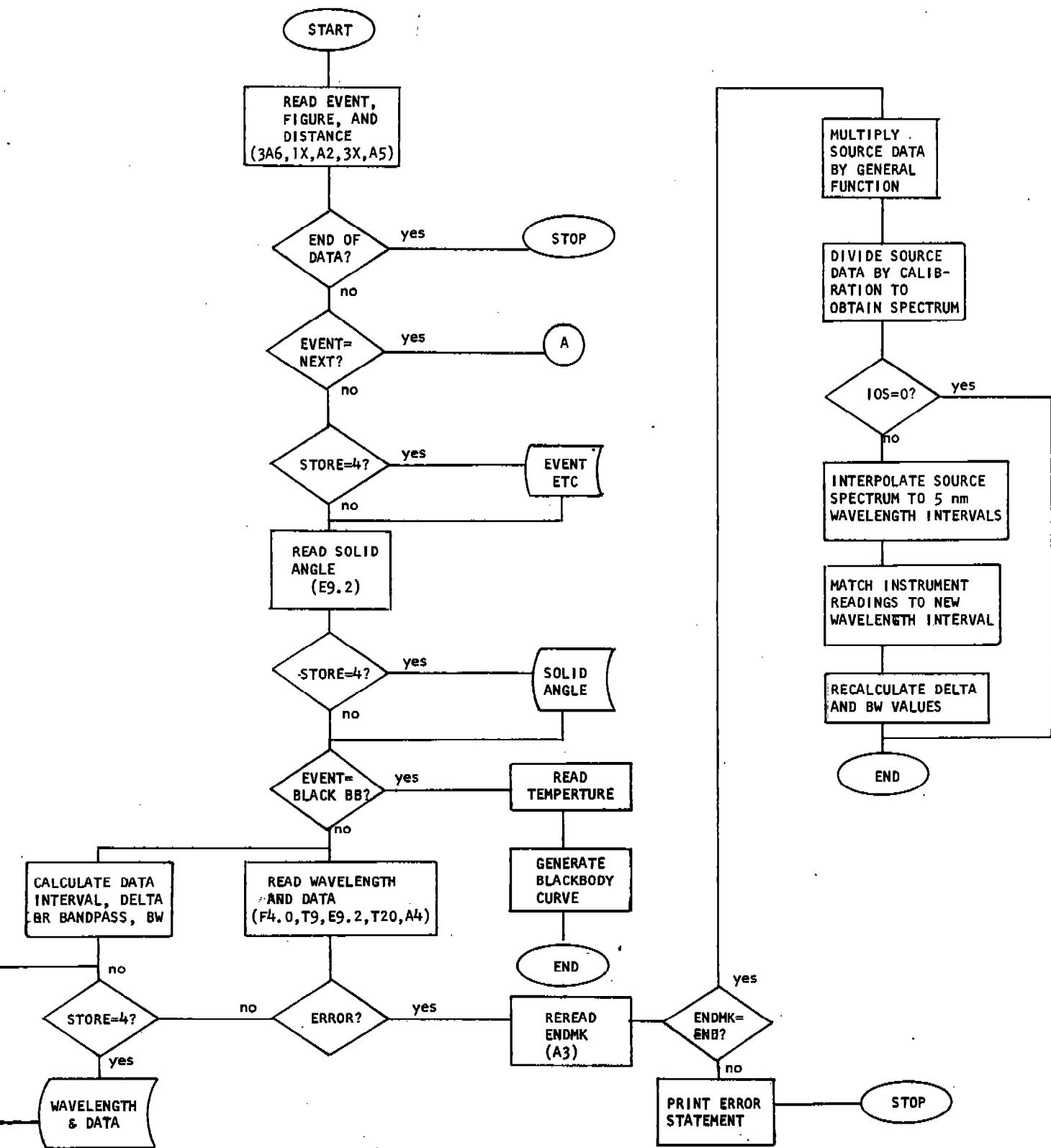


FIGURE A-6. EXPANDED FLOWCHART FOR READING SOURCE DATA

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

distances from a standard. Either DFU or DFV may be calculated by the following formulas:

$$\text{DFU (or DFV)} = \left(\frac{\text{Distance Used}}{\text{Distance Specified}} \right)^2$$

Within the computer program all ultraviolet calibration factors are multiplied by DFU. All other calibration factors are multiplied by DFV. Also included on this card are the bandpass for three separate monochromator systems and the separating wavelengths. However, if this card is left completely or partially blank, values are assigned to all these parameters.

(2) Calibration Header. One card of free formatted information which uniquely identifies the calibration deck.

(3) Calibration Values. The calibration values may be submitted in one, two or three separate decks. These decks represent three different spectral regions. Each deck must have its own header card and end card. An overlap region is permitted between decks. The separating wavelengths specified on the distance factor card determine the deck from which calibration factors are taken. It is not necessary that a calibration be given for every wavelength at 5-nanometer intervals because the calibration will be interpolated. However, at points of discontinuity interpolated values will be incorrect if not listed every 5 nanometers in this region. Data values for which no calibration may be computed will be ignored. As a convenience to the user, calibration factors may be computed from readings from a standard lamp by submitting both the lamp spectrum and instrument readings from the standard lamp. For each portion of the spectrum, the readings from the standard lamp are submitted first and then the spectrum of the standard lamp is submitted. This form of input is considered raw input.

(4) End Card. An end card must immediately follow the end of each portion of the calibration factor values.

(5) Raw Input. In the case of raw calibration input, the standard lamp spectrum values and the instrument readings must each have header and end cards. If the calibration is submitted in raw form, the instrument readings and the standard lamp spectrum must match item by item.

e. Bio-Deck Data. Part of the biological data is read into the computer program as a large array consisting of the following items: S_λ , U_λ , V_λ , V'_λ , T_λ , $T \cdot A_{\text{peak}}$, R_λ , A_λ . All other functions are read into the computer by wavelength and function. It is not necessary to enter zero values for this second group of biological functions. The biological functions are presented in Table A-3.

HSE-RL/WP Technical Guide
 Hazard Analysis of Broad-Band Optical Sources

TABLE A-3. BIODECK DATA

<u>FUNCTION</u>	<u>FORTRAN NAME</u>	<u>PRINTER HEADING</u>	<u>DESCRIPTION</u>
S	SLAMBD	S-LAMBDA	ACGIH UV hazard envelope function
U	ULAMBD	U-LAMBDA	1936 CIE UV skin erythema action spectrum
A	ALAMBD	A-LAMBDA	ANSI Z136 laser weighting - UV hazard function
T	TLAMBD	T-LAMBDA	Ocular media transmission
T-APE	TALAMB	T-A-LAMBDA	Absorption in the retina
R	CALAMB	C-A-LAMBDA	Retinal burn correction factor
V	VLAMBD	V-LAMBDA	CIE-1970 photopic visibility function
V'	VPLAMB	V*-LAMBDA	CIE-1970 scotopic visibility function
B	BLAMBD	B-LAMBDA	ACGIH blue-light hazard function
X	XBLAMB	X-BAR LAMBDA	CIE-1931 blue chromaticity coordinate
Y	YBLAMB	Y-BAR LAMBDA	CIE-1931 green chromaticity coordinate
Z	ZBLAMB	Z-BAR LAMBDA	CIE-1931 red chromaticity coordinate
P445	P445LB	P-445	Dartnall nomogram absorption coefficient for blue
P535	P535LB	P-535	Dartnall nomogram absorption coefficient for green
P575	P575LB	P-575	Dartnall nomogram absorption coefficient for red

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

f. Filter Data. Up to three filters may be entered into the runstream. The source will be evaluated normally and, in addition, the source spectrum as it would appear through the filters will be evaluated. If two filters are used, the effect of both filters in tandem will be evaluated.

g. General Function. After the data have been recorded and possibly key punched, a scaling error may be corrected through the use of this function. A portion of the instrument readings may be multiplied by a constant. As many correction factors as necessary may be used. This function must be ended with an end card. However, no header card is used for this function.

h. Source Deck. The source deck (called events for this program) consists of the event card, the source solid angle and the instrument readings collated by wavelength. If more space is needed for description of the source, an additional description card may be inserted after the event card. This information is printed in place of the second description card entered at the start of the runstream. In case duplicate readings are given for the same wavelength, the second value is ignored unless it is a spectral peak. If spectral data are provided for which no calibration factor is given or may be interpolated, then those data are also ignored. Spectral peaks should be labelled as peaks on the input and inserted into the instrument readings in the proper wavelength sequence after the continuum values. The continuum should be subtracted from these peaks before entering the values in the deck. Neighboring spectral readings should be screened to make sure part of the peak is not included in these readings. As many event decks may be submitted in series as desired. An end card must follow each deck.

i. Plot Deck. The plot deck consists of only two cards. Without these two cards, no plot will be created; however, the run will terminate normally.

j. Fin Card. This card signifies the end of the run.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

APPENDIX B
COMPUTER LISTING

@FDR,S RKS\$LMDSW2.SWP200
FOR S 4R1 E -05/15/81-08:23:51 (50,)

MAIN PROGRAM

STORAGE USED: CODE(1) 016431; DATA(0) 104124; BLANK COMMON(2) 000000

EXTERNAL REFERENCES (BLOCK, NAME)

0003 DATEIM
0004 PLOTS
0005 PLOT
0006 SYMBOL
0007 NUMBER
0010 SCALE
0011 AXIS
0012 LINE
0013 SCALG
0014 LGLIN
0015 NINTR\$
0016 NRDC\$
0017 NI03\$
0020 NI02\$
0021 NRDU\$
0022 NERR2\$
0023 NWDU\$
0024 NPRT\$
0025 NSTOP\$
0026 NI01\$
0027 ALOG10
0030 XPRI
0031 NWEF\$
0032 NREW\$
0033 NERR3\$
0034 ALOG
0035 EXP
0036 NERR6\$
0037 NERR5\$
0040 NERR4\$
0041 DEXP

B-2

STORAGE ASSIGNMENT (BLOCK, TYPE, RELATIVE LOCATION, NAME)

0001	014370	1L	0000	103160	10F	0000	100503	10F	0000	102742	10F	0000	109141	10F
0001	012336	10L	0001	011757	10L	0001	013024	10L	0001	014203	10L	0001	010777	10L
0001	014326	10L	0001	012654	10L	0000	102707	100F	0001	013377	100L	0001	014044	100L
0001	015503	100L	0001	000270	100L	0001	003440	1000L	0001	005446	1010L	0001	005454	1011L
0001	005463	1012L	0001	005472	1013L	0001	005501	1014L	0001	005506	1015L	0001	005514	1016L
0001	005524	1018L	0001	005531	1020L	0001	005542	1040L	0001	005225	1041L	0001	005237	1042L
0001	005251	1043L	0001	005262	1045L	0001	000412	105L	0001	005771	1060L	0001	006015	1070L
0001	001627	1073G	0001	006054	1090L	0001	011033	11L	0001	012672	11L	0001	015543	110L
0001	006100	1100L	0001	006127	1110L	0001	002005	1130G	0001	011075	12L	0001	000437	120L
0001	015721	120L	0001	002144	1200G	0000	100576	121F	0001	002230	1233G	0001	000450	125L

0001	002255	1251G	0001	000540	126L	0001	002303	1272G	0001	011052	13L	0001	000557	130L
0001	006233	1321L	0001	006171	1322L	0001	000200	1323L	0001	006207	1324L	0001	006225	1325L
0001	005131	1330L	0000	100764	1331F	0000	100770	1332F	0000	100771	1334F	0001	007046	1339L
0001	007122	1340L	0001	007172	1343L	0000	103012	1347F	0001	000651	135L	0000	100772	1350F
0001	002461	1360G	0001	007211	1360L	0001	002470	1364G	0001	007245	1366L	0001	007246	1370L
0001	002504	1373G	0001	007320	1375L	0000	101004	1380F	0001	007350	1390L	0001	007417	1396L
0000	100611	140F	0001	007420	1400L	0001	007472	1405L	0000	101016	1410F	0001	007527	1420L
0001	007603	1426L	0001	007604	1430L	0001	007830	1435L	0001	002631	1437G	0000	101032	1440F
0001	007716	1450L	0001	002656	1453G	0001	007773	1456L	0001	007774	1460L	0001	010052	1465L
0000	101046	1470F	0001	002745	1474G	0001	010187	1480L	0001	010166	1486L	0001	010167	1490L
0001	010247	1495L	0001	012005	15L	0001	000333	150L	0000	101063	1500F	0001	002754	1500G
0001	002770	1507G	0001	010306	1510L	0001	010237	1515L	0001	010367	1516L	0000	101100	1520F
0001	003072	1541G	0001	003117	1554G	0001	003209	1575G	0001	000673	160L	0001	003215	1601G
0001	003231	1610G	0001	003333	1642G	0001	010716	1646L	0000	101262	1650F	0000	101300	1655F
0001	003360	1655G	0000	101315	1660F	0000	101366	1670F	0001	003403	1670G	0000	101361	1680F
0000	101404	1690F	0001	002301	170L	0000	101422	1700F	0000	101442	1710F	0001	003444	1711G
0000	101462	1720F	0000	101502	1730F	0000	101524	1740F	0000	101546	1750F	0000	101570	1760F
0000	101610	1770F	0000	101626	1780F	0000	101645	1790F	0000	100614	180F	0000	101670	1800F
0000	101706	1810F	0000	101731	1820F	0000	101754	1830F	0000	102000	1880F	0000	102013	1890F
0000	102026	1895F	0000	102045	1900F	0001	006304	1905L	0001	006412	1909L	0001	006426	1910L
0001	006370	1915L	0001	006512	1930L	0001	000062	2L	0001	014377	2L	0000	103164	20F
0000	102760	20F	0001	013051	20L	0001	012012	20L	0001	013345	20L	0001	012717	20L
0001	012356	20L	0001	014227	20L	0001	013201	20L	0001	013724	20L	0001	011013	20L
0001	016012	200L	0001	002336	200L	0001	003685	2011G	0001	003650	2015G	0001	006573	2020L
0001	006675	2030L	0001	003721	2033G	0001	006717	2040L	0001	006733	2050L	0000	100618	210F
0001	016041	210L	0001	000752	2100L	0001	004061	2107G	0001	001147	2120L	0001	004135	2124G
0001	001205	2130L	0001	001425	2140L	0001	004204	2147G	0001	001436	2150L	0001	001500	2170L
0001	004302	2174G	0001	001511	2180L	0001	001571	2190L	0000	100617	220F	0001	016124	220L
0001	001606	2200L	0001	004344	2216G	0001	002044	2220L	0001	002113	2230L	0001	016150	225L
0001	004441	2256G	0001	002356	230L	0001	016160	230L	0001	002127	2300L	0001	004506	2305G
0001	002164	2310L	0001	004516	2311G	0001	002224	2320L	0001	002243	2330L	0001	002247	2340L
0001	004665	2345G	0001	002276	2350L	0001	004672	2353G	0001	004673	2356G	0001	002301	2360L
0001	002207	2370L	0001	004725	2374G	0001	002251	2380L	0001	002270	2382L	0001	002274	2385L
0001	013055	24L	0001	004740	2404G	0001	004757	2413G	0001	005027	2434G	0001	005055	2451G
0001	005116	2465G	0001	013057	25L	0001	011111	25L	0001	005202	2505G	0001	005231	2521G
0001	005243	2530G	0001	005255	2537G	0001	005520	2574G	0001	005535	2603G	0001	005762	2647G
0001	006045	2672G	0001	006145	2721G	0001	000014	274G	0001	006241	2757G	0001	002417	290L
0001	000033	3L	0000	100505	30F	0000	102765	30F	0001	013222	30L	0001	012366	30L
0001	013364	30L	0001	011154	30L	0001	013731	30L	0001	012040	30L	0001	013074	30L
0001	014640	30L	0001	014234	30L	0001	002426	300L	0001	006462	3042G	0001	006473	3053G
0001	006521	3073G	0001	011130	31L	0000	100627	310F	0001	006530	3101G	0001	007012	3170G
0001	007020	3175G	0001	007031	3205G	0001	007131	3242G	0001	011200	33L	0001	002523	330L
0001	007223	3305G	0001	007255	3332G	0001	007342	3365G	0001	011206	34L	0000	100632	340F
0001	007366	3401G	0001	007404	3415G	0001	007427	3431G	0001	002552	345L	0001	007517	3465G
0000	102720	35F	0000	100511	35F	0001	011300	35L	0001	014250	35L	0000	100633	350F
0001	007545	3503G	0001	007566	3520G	0001	007613	3536G	0001	007705	3573G	0001	002577	360L
0001	007734	3612G	0001	007755	3627G	0001	010003	3646G	0000	100643	370F	0001	004720	3700L
0001	010074	3703G	0001	010102	3707G	0001	010127	3723G	0001	010145	3737G	0001	010151	3743G
0001	010176	3757G	0001	002673	385L	0000	102770	39F	0001	002703	390L	0001	000043	4L
0001	014455	4L	0001	015122	4L	0000	103165	40F	0000	103034	40F	0000	100507	40F
0000	103144	40F	0001	014251	40L	0001	011344	40L	0001	014342	40L	0001	013240	40L
0001	013762	40L	0001	012072	40L	0001	012372	40L	0001	013100	40L	0001	002712	400L
0001	010271	4015G	0001	010301	4022G	0001	010323	4036G	0001	010344	4052G	0001	010352	4057G
0001	000217	406G	0001	003010	420L	0001	003040	430L	0001	003134	441L	0001	003153	442L
0001	003251	444L	0001	003144	445L	0001	003301	447L	0001	000170	45L	0001	000322	450G
0001	003375	450L	0000	100646	451F	0000	100653	460F	0001	011400	4624G	0001	011414	4633G
0001	011575	4730G	0001	011575	4733G	0001	011605	4745G	0001	011616	4756G	0001	011616	4761G
0001	011624	4772G	0001	003452	480L	0000	100657	490F	0001	014461	5L	0001	015275	5L

0000	103056	50F	0000	100513	50F	0001	012377	50L	0001	012242	50L	0001	013777	50L
0001	011550	50L	0001	014656	50L	0001	003463	500L	0001	011631	5001G	0001	011635	5007G
0000	100660	510F	0001	012326	5163G	0001	003510	520L	0001	012432	5211G	0001	012456	5216G
0001	012645	5247G	0001	012710	5263G	0001	003510	530L	0001	013033	5301G	0001	013173	5335G
0001	013254	5361G	0001	013324	5375G	0001	014515	54L	0000	100670	540F	0001	003525	541L
0001	003535	542L	0001	013500	5432G	0000	100674	544F	0001	013611	5447G	0001	003627	545L
0001	013712	5463G	0000	100516	55F	0001	014524	55L	0001	012404	55L	0000	100673	550F
0001	013761	5505G	0001	000544	552G	0001	003636	555L	0000	100675	560F	0001	003726	561L
0000	100701	562F	0001	003711	563L	0001	014555	5714G	0001	014617	5742G	0001	014626	5746G
0001	000615	576G	0001	003777	580L	0000	100727	590F	0000	103145	60F	0000	103108	60F
0001	015263	60L	0001	011555	60L	0001	014353	60L	0001	014007	60L	0001	012243	60L
0000	102054	6000F	0001	014726	6000G	0000	102204	6001F	0000	102065	6010F	0000	101123	6010F
0000	102105	6011F	0000	102117	6012F	0000	102137	6013F	0000	102151	6014F	0000	102171	6015F
0001	000624	602G	0000	102213	6020F	0000	101140	6020F	0000	102225	6021F	0000	102241	6022F
0000	102701	6023F	0000	102256	6024F	0000	101102	6025F	0000	102276	6025F	0000	102304	6026F
0000	102313	6027F	0000	102335	6028F	0000	102343	6030F	0000	101145	6030F	0000	101157	6031F
0000	102354	6031F	0000	101177	6032F	0000	101217	6033F	0000	101241	6034F	0000	102370	6035F
0000	102376	6036F	0000	102405	6037F	0000	102413	6040F	0001	010477	6040L	0000	102415	6050F
0000	102431	6051F	0000	102444	6060F	0001	015174	6065G	0000	102463	6080F	0000	102470	6090F
0000	102475	6095F	0001	016055	61L	0000	100730	610F	0001	015235	6103G	0001	010442	6130L
0001	010447	6131L	0001	010454	6132L	0001	010461	6133L	0001	004055	619L	0001	004035	620L
0001	015615	6215G	0001	004104	622L	0001	004131	623L	0001	004162	625L	0001	004200	626L
0001	004246	628L	0001	004271	629L	0001	015250	63L	0001	004325	630L	0001	004273	631L
0001	016236	6320G	0001	016241	6323G	0001	004302	633L	0001	004316	638L	0001	004336	640L
0001	004345	645L	0001	004353	650L	0001	000773	657G	0000	100741	660F	0000	100711	6650F
0001	004364	670L	0001	004376	680L	0001	004407	685L	0001	004473	687L	0001	004430	690L
0001	004521	692L	0001	004642	693L	0000	103133	70F	0001	014013	70L	0001	000232	70L
0001	012137	70L	0001	012470	70L	0001	014664	70L	0000	102502	7000F	0000	102513	7010F
0000	102522	7020F	0000	102530	7030F	0000	102557	7040F	0001	004741	705L	0000	102616	7050F
0000	102626	7060F	0000	102636	7070F	0000	102644	7080F	0000	102652	7090F	0001	012143	71L
0001	001133	714G	0001	004775	720L	0001	005006	730L	0001	012165	75L	0001	005041	750L
0001	012230	77L	0001	001363	772G	0001	005110	785L	0001	005174	795L	0000	100522	80F
0001	014570	80L	0001	014030	80L	0001	012235	80L	0001	012527	80L	0001	015472	80L
0001	005162	800L	0000	102661	8000F	0000	102672	8010F	0001	005223	830L	0001	005321	860L
0001	005322	870L	0001	005330	880L	0001	005336	890L	0000	100523	90F	0001	015772	90L
0001	014040	90L	0001	005344	900L	0001	005652	910L	0001	005360	920L	0001	005366	930L
0001	005374	940L	0000	100533	95F	0001	005402	950L	0001	000364	96L	0001	005410	960L
0001	000406	97L	0001	005416	970L	0001	000375	98L	0001	005424	980L	0000	100580	99F
0001	005432	990L	0001	016352	999L	0001	010721	9999L	0000	R 064071	A	0000	R 062611	A
0000	R 037164	ACGIH	0000	R 002520	ALAMBD	0000	R 037166	ANSI	0000	I 057606	ASTR	0000	R 062612	B
0000	R 064072	B	0000	R 062327	BANPAS	0001	R 015057	BLACK	0000	R 064102	BLACK	0000	R 012500	BLAMBD
0000	R 037167	BLUHAZ	0000	R 037161	BLURAD	0000	R 050454	BW	0000	R 053175	BWAV1	0000	R 053176	BWAV2
0000	R 062613	C	0000	R 006510	CALAMB	0000	I 057443	CALDAT	0000	R 062371	CALFAC	0000	I 057205	CALHDR
0000	I 057241	CALIR	0000	I 062423	CALTAB	0000	I 057223	CALUV	0000	R 026455	CF	0000	R 062420	CFRES
0000	R 037165	CIE	0000	R 062357	CM	0000	R 053177	CUV	0000	R 062614	D	0000	R 037210	DATA
0000	R 037211	DATA1	0000	I 057472	DATE	0000	R 047204	DELTA	0000	R 052450	DELTAP	0000	I 057403	DESCRP
0000	R 023731	DFU	0000	R 023730	DFV	0000	R 062362	DIV	0000	R 023732	DP	0000	I 062565	DSTORE
0000	R 062615	E	0000	R 037162	EDELLB	0000	R 037202	EECA	0000	R 043203	EFT	0000	R 027725	EFOFX
0000	R 023735	EINSTR	0000	R 031175	ELAMBD	0000	R 051200	ELAMP	0000	I 057474	ENDMK	0000	R 062370	EPRINT
0000	R 035165	ERETLB	0000	I 100455	EVENT	0000	I 057444	EVENT	0000	I 057447	EVENT2	0000	D 064103	EX
0000	R 062356	FIG	0000	I 057257	FILHDR	0000	I 057275	FILHD2	0000	I 057313	FILHD3	0000	R 045723	FILTER
0000	R 062342	FLPLOT	0000	I 057175	FLTCNT	0000	R 025205	FOFX	0000	R 100501	FPN	0000	R 062422	FTRAN
0000	R 037213	FT1	0000	R 040463	FT2	0000	R 041733	FT3	0000	I 100447	FVENT	0000	I 057463	FVENT
0000	I 062332	FWAVE	0000	I 057442	GENRL	0000	I 057203	GENFUN	0000	I 057204	GENWEI	0000	I 062431	GFTAB
0000	R 045734	GLAMBD	0000	I 100460	GLINE	0000	I 062333	I	0000	I 066637	IBUF	0000	I 062603	IC
0000	I 062607	ICAL	0000	I 062413	IDEFTA	0000	I 062411	IFIRST	0000	I 062353	IFLAG	0000	I 062340	IFOUR
0000	I 062605	IG	0000	I 062404	II	0000	I 100477	IJ	0000	I 062366	IJK	0000	R 037206	ILLUM
0000	I 062410	IMIN	0000	I 100478	INCREM	0000	103417	INJPS	0000	103407	INJPS	0000	103427	INJPS

0000	103446	INJP\$	0000	103362	INJP\$	0000	103606	INJP\$	0000	103423	INJP\$	0000	103346	INJP\$
0000	103402	INJP\$	0000	103460	INJP\$	0000	103413	INJP\$	0000	103366	INJP\$	0000	103372	INJP\$
0000	103376	INJP\$	0000	103472	INJP\$	0000	103354	INJP\$	0000	103433	INJP\$	0000	103453	INJP\$
0000 I	062367	INTVL	0000 I	062335	IONE	0000 I	062343	IOS	0000 I	062412	ISEC	0000 I	100475	ISIZE
0000 I	062346	ITCAL	0000 I	062403	ITEST	0000 I	062337	ITHREE	0000 I	062336	ITWO	0000 I	062351	IVAL
0000 I	062414	IX	0000 R	064101	IX	0000 I	062400	IXPRS	0000 I	062610	IY	0000 I	062334	J
0000 I	062604	JC	0000 I	062606	JG	0000 I	062374	JPLUS1	0000 I	062352	K	0000 I	062355	L
0000 I	057167	LAMBDA	0000 I	057331	LAMPHD	0000 I	057365	LAMPIR	0000 I	057347	LAMPUV	0000 R	037163	LDELLB
0000 I	062344	LINLOG	0000 I	062416	LINMAX	0000 R	033715	LLAMBD	0000 I	062376	LMIN1	0000 I	062364	LMN
0000 I	062377	LPLUS1	0000 I	057602	LSTWAV	0000 R	037207	LUMIN	0000 I	062354	LWAVE	0000 I	062415	LYNE
0000 I	064100	M	0000 I	062361	MAXELM	0000 I	062347	MAXWAV	0000 I	062405	MINELM	0000 I	062421	ML
0000 I	100500	MW	0000 I	062417	MX	0000 I	062373	MXMIN1	0000 I	062406	NNTES	0000 I	057440	NOCOF1
0000 I	057441	NOCOF2	0000 I	062341	NOCOF3	0000 I	100474	NPLOT	0000 I	057437	NUMFIL	0000 R	023734	DMEGA
0000 I	057471	PAGE	0000 R	037205	PCTNIR	0000 R	037203	PCTUV	0000 R	037204	PCTVI	0000 I	057603	PEAK
0000 R	047730	PKCAL	0000 I	062326	PKCON	0000 R	053174	PREV	0000 I	064074	PRTFT	0000 I	057475	PRTLAM
0000 R	037173	P445	0000 R	017740	P445LB	0000 R	037174	P535	0000 R	021210	P535LB	0000 R	037175	P575
0000 R	022460	P575LB	0000 R	062617	R	0000 R	062621	RLS	0000 R	064073	SEQUEN	0001 R	014263	SEQUEN
0000 R	000000	SLAMBD	0000 I	057605	STORE	0000 R	062616	SUM	0001 R	012563	SUM	0000 R	062345	SUMRY
0001 R	012743	SUM1	0000 R	062620	SUM1	0000 I	057604	SUPRES	0000 R	062360	T	0000 R	005240	TALAMB
0000 R	032445	TEMP	0000 R	003770	TLAMBD	0000 R	062402	TLRES	0000 R	037200	TRANS	0000 R	037201	TRANTX
0000 R	001250	ULAMBD	0000 R	062350	VAL	0000 R	037176	VE	0000 R	037177	VIE	0000 R	007760	VLAMBD
0000 R	011230	VPLAMB	0000 R	037212	WAVE	0000 R	062363	WAVE1	0000 R	062365	WAVE2	0000 R	062372	X
0000 R	064105	XAXIS	0000 R	037170	XBAR	0000 R	013750	XBLAMB	0000 R	062407	XMIN	0000 R	062375	XPRS1
0000 R	065362	YAXIS	0000 R	037171	YBAR	0000 R	015220	YBLAMB	0000 R	100502	YY	0000 R	062401	Z
0000 R	037172	ZBAR	0000 R	016470	ZBLAMB									

B
G

00100	1*	C											0000000	
00100	2*	C	PROGRAM NAME	LASER MICROWAVE DIVISION SPECTRAL WEIGHTING PROGRAM									0000000	
00100	3*	C											0000000	
00100	4*	C	JUSTIFICATION	REQUESTED BY LASER MICROWAVE DIVISION	2 JAN 1978								0000000	
00100	5*	C		BY DIV CHIEF ROBERT T. WANGEMANN									0000000	
00100	6*	C											0000000	
00100	7*	C	JOB NUMBER	UNASSIGNED AS OF 30 JUNE 1976									0000000	
00100	8*	C											0000000	
00100	9*	C	COMPUTER	UNIVAC 1108-EXEC 8									0000000	
00100	10*	C											0000000	
00100	11*	C	PROGRAMMER	ROBERT LEE SCHMITT									0000000	
00100	12*	C											0000000	
00100	13*	C	DATE COMPLETED	JUNE 1976									0000000	
00100	14*	C											0000000	
00100	15*	C	CHANGES -	UPDATED AUG 1978 BY JUDY BRANDT									0000000	
00100	16*	C		UPDATED AUG 1979 BY WES MARSHALL									0000000	
00100	17*	C		UPDATED JAN 1981 BY WES MARSHALL									0000000	
00100	18*	C											0000000	
00100	19*	C	SUBROUTINES	IDENT									0000000	
00100	20*	C		INITIAL									0000000	
00100	21*	C		INTERP									0000000	
00100	22*	C		SUM									0000000	
00100	23*	C		SUM1									0000000	
00100	24*	C		GLAMCO									0000000	
00100	25*	C		ADJUST									0000000	
00100	26*	C		DELSUB									0000000	
00100	27*	C		FSUB									0000000	
00100	28*	C		RAD									0000000	
00100	29*	C		FILSUM									0000000	

00100	30*	C	SEQUEN	000000
00100	31*	C	PRTCON	000000
00100	32*	C	HEADIN	000000
00100	33*	C	BDREAD	000000
00100	34*	C	BLKBODY	000000
00100	35*	C	HPLOT	000000
00100	36*	C		000000
00100	37*	C	ABSTRACT PROGRAM REDUCES SPECTRAL DATA TAKEN FROM VARIOUS BROADBAND	000000
00100	38*	C	OPTICAL SOURCES PRODUCING TABLES OF PERTINENT INFORMATION	000000
00100	39*	C	AND PLOT GRAPHS.	000000
00100	40*	C		000000
00100	41*	C	INPUT RECORD LAYOUT	000000
00100	42*	C		000000
00100	43*	C	SOURCE DESCRIPTION CARD	000000
00100	44*	C		000000
00100	45*	C	ONE OF TWO	000000
00100	46*	C		000000
00100	47*	C	1-78 DESCRIPTION	000000
00100	48*	C		000000
00100	49*	C	TWO OF TWO	000000
00100	50*	C		000000
00100	51*	C	1-72 DESCRIPTION	000000
00100	52*	C		000000
00100	53*	C		000000
00100	54*	C	CALCULATION CONTROL CARD	000000
00100	55*	C		000000
00100	56*	C		000000
00100	57*	C	1 NUMBER OF FILTERS	000000
00100	58*	C	2 NUMBER OF DATA FIELDS FOR FILTER ONE	000000
00100	59*	C	3 NUMBER OF DATA FIELDS FOR FILTER TWO	000000
00100	60*	C	4 NUMBER OF DATA FIELDS FOR FILTER THREE	000000
00100	61*	C	5 FORM OF CALIBRATION DECK -- BLANK=RAW, 1=COMPUTED, 2=NONE	000000
00100	62*	C	3 -- RAW WITH OVERLAP, 4 -- COMPUTED WITH OVERLAP	000000
00100	63*	C	5 -- RAW WITH THREE DECKS, 6 -- COMPUTED WITH THREE DECKS	000000
00100	64*	C	6-7 SPECIFIC FUNCTION TO BE LISTED SPECTRALLY	000000
00100	65*	C	WHICH MAY BE PLOTTED	000000
00100	66*	C	8 GENERAL FUNCTION FOFX 1 -- GENERAL FUNCTION TO BE READ	000000
00100	67*	C	9 SPECIFIC FUNCTION PLOTTED OR NOT 1 -- YES	000000
00100	68*	C	10 SPECIFIC DATA DECK TO BE STORED ON COMPUTER FILE	000000
00100	69*	C	11 SOURCE MAY BE INTERPOLATED TO 5 NM INTERVALS 1 -- YES	000000
00100	70*	C	12 PLOT OF SPECTRAL IRRADIANCE MAY BE SUPPRESSED -- 1 IS YES	000000
00100	71*	C	13 LINEAR OR LOG PLOTS: 0 - BOTH, 1 - LINEAR, 2 - LOG	000000
00100	72*	C	14 SUMARY PAGES ONLY: 1 IS YES	000000
00100	73*	C		000000
00100	74*	C	DISTANCE FACTOR CARD	000000
00100	75*	C		000000
00100	76*	C	1-10 DISTANCE FACTOR FOR ULTRAVIOLET LIGHT	000000
00100	77*	C	11-20 DISTANCE FACTOR FOR VISIBLE LIGHT	000000
00100	78*	C	21-30 BANDPASS FOR ULTRAVIOLET MONOCHROMETER SYSTEM	000000
00100	79*	C	31-40 DIVIDING WAVELENGTH BETWEEN UV AND VISIBLE SPECTRUM	000000
00100	80*	C	41-50 BANDPASS FOR VISIBLE MONOCHROMETER SYSTEM	000000
00100	81*	C	51-60 DIVIDING WAVELENGTH BETWEEN VISIBLE AND NIR SPECTRUM	000000
00100	82*	C	61-70 BANDPASS FOR NIR MONOCHROMETER SYSTEM	000000
00100	83*	C		000000
00100	84*	C		000000
00100	85*	C	GENERAL DATA CARD	000000
00100	86*	C		000000
00100	87*	C	1-4 WAVE LENGTH	000000

00100 88* C 9-17 DATA---- WHERE DATA IS CALIBRATION
 00100 89* C FACTOR, B-LAMBDA , X-BAR LAMBDA , Y-BAR
 00100 90* C LAMBDA , Z-BAR LAMBDA , P445 LAMBDA ,
 00100 91* C P535 LAMBDA , P575 LAMBDA , COMPUTED
 00100 92* C FILTER DATA , DATA READINGS
 00100 93* C
 00100 94* C FILTER DATA IN RAW FORM
 00100 95* C
 00100 96* C 1-4 WAVE LENGTH
 00100 97* C 9-17 DIVIDEND
 00100 98* C 25-33 DIVISOR
 00100 99* C
 00100 100* C BIO-DECK
 00100 101* C
 00100 102* C 1-4 WAVE LENGTH
 00100 103* C 5-13 S-LAMBDA
 00100 104* C 14-22 U-LAMBDA
 00100 105* C 23-31 V-LAMBDA
 00100 106* C 32-40 VP-LAMBDA
 00100 107* C 41-49 T-LAMBDA
 00100 108* C 50-58 TA-LAMBDA
 00100 109* C 59-67 CA-LAMBDA
 00100 110* C 68-76 A-LAMBDA
 00100 111* C
 00100 112* C EVENT NAME CARD
 00100 113* C
 00100 114* C 1-18 EVENT NAME
 00100 115* C 20-21 FIGURE NUMBER
 00100 116* C 27-29 MEASUREMENT DISTANCE
 00100 117* C
 00100 118* C SOURCE SOLID ANGLE CARD
 00100 119* C
 00100 120* C 1-9 OMEGA
 00100 121* C
 00100 122* C
 00100 123* C
 00100 124* C
 00100 125* C END CARD
 00100 126* C
 00100 127* C
 00100 128* C
 00100 129* C
 00100 130* C
 00100 131* C 1-3 END
 00100 132* C
 00100 133* C PRINTER LAYOUT
 00100 134* C 2-6 WAVE LENGTH
 00100 135* C 9-17 CALIBRATION FACTOR
 00100 136* C 20-28 INSTRUMENT READINGS
 00100 137* C 31-39 ADJUSTED INSTRUMENT READINGS
 00100 138* C 42-50 SPECTRAL IRRADIANCE OF SOURCE
 00100 139* C 53-61 SPECTRAL RADIANCE OF SOURCE
 00100 140* C 64-72 3-MM SPECTRAL-RETINAL IRRADIANCE
 00100 141* C 75-83 7-MM SPECTRAL-RETINAL IRRADIANCE
 00100 142* C 86-94 GENERAL WEIGHTING FUNCTION RESULTS
 00100 143* C 97-105 SPECTRAL FILTER TRANSMISSIONS FOR FILTER ONE
 00100 144* C 108-116 SPECTRAL FILTER TRANSMISSIONS FOR FILTER TWO
 00100 145* C 119-127 SPECTRAL FILTER TRANSMISSIONS FOR BOTH FILTERS
 00100 146* C SINGLE WAVE CALCULATIONS
 00100 147* C

00100 146* C 3-96 RESULT DESCRIPTION 000000
 00100 147* C 100-10B RESULT 000000
 00100 148* C FILE RS\$SWP-PLOT LAY OUT 000000
 00100 149* C 1-9 ELAMBDA 000000
 00100 150* C 000000
 00100 151* C 000000
 00100 152* C 000000
 00100 153* C 000000
 00100 154* C 000000
 00100 155* C 000000
 00100 156* C 000000
 00100 157* C BIODECK TABLES 000000
 00101 158* C REAL SLAMBD(340,2) @ ACGIH UV HAZARD ENVELOPE FUNCTION 000000
 00103 159* C REAL ULAMBD(340,2) @ 1936 CIE UV SKIN ERYTHEMA ACTION SPECTRUM 000002
 00104 160* C REAL ALAMBD(340,2) @ ANSI Z136 LASER WEIGHTING-UV HAZARD FUNCTION 000002
 00105 161* C REAL TLAMBD(340,2) @ OCULAR MEDIA TRANSMISSION 000002
 00106 162* C REAL TALAMB(340,2) @ ABSORPTION IN THE RETINA 000002
 00107 163* C REAL CALAMB(340,2) @ RECIPROCAL OF ANSI-NEAR-INFRARED RETINAL
B-00 BURN CORRECTION FACTOR 000002
 00108 164* C REAL VLAMBD(340,2) @ CIE-1970 PHOTOPIC VISIBILITY FUNCTION 000002
 00111 165* C REAL VPLAMB(340,2) @ CIE-1970 SCOTOPIC VISIBILITY FUNCTION 000002
 00112 166* C REAL BLAMBD(340,2) @ ACGIH BLUE-LIGHT HAZARD FUNCTION 000002
 00113 167* C REAL XBLAMB(340,2) @ CIE-1931 BLUE CHROMATICITY COORDINATE 000002
 00114 168* C REAL YBLAMB(340,2) @ CIE-1931 GREEN CHROMATICITY COORDINATE 000002
 00115 169* C REAL ZBLAMB(340,2) @ CIE-1931 RED CHROMATICITY COORDINATE 000002
 00116 170* C REAL P445LB(340,2) @ DARTNALL NOMOGRAM ABSORPTION COEFFICIENT BLUE 000002
 00117 171* C REAL P535LB(340,2) @ DARTNALL NOMOGRAM ABSORPTION COEFFICIENT GREEN 000002
 00118 172* C REAL P575LB(340,2) @ DARTNALL NOMOGRAM ABSORPTION COEFFICIENT FO- -ED 000002
 00119 173* C 000002
 00120 174* C END BIODECK TABLES 000002
 00120 175* C 000002
 00120 176* C 000002
 00121 177* C REAL DFV @ DISTANT FACTOR TO ADJUST VISIBLE RADIATION 000002
 00121 178* C 000002
 00122 179* C REAL DFU @ DISTANT FACTOR TO ADJUST UV RADIATION 000002
 00122 180* C 000002
 00123 181* C REAL DP(2) @ PUPIL SIZE USED IN RETINA CALCULATIONS 000002
 00124 182* C REAL OMEGA @ SOURCE SOLID ANGLE FOR SPECTRAL READINGS 000002
 00125 183* C REAL EINSTR(340,2) @ SPECTRAL READINGS OF SOURCE UNDER STUDY 000002
 00126 184* C REAL FOFX(340,2) @ FUNCTION TO MODIFY INSTRUMENT READINGS 000002
 00127 185* C REAL CF(340,2) @ CALIBRATION FACTOR 000002
 00130 186* C REAL EIFOFX(340,2) @ ADJUSTED INSTRUMENT READINGS 000002
 00131 187* C REAL ELAMBD(340,2) @ SPECTRAL IRRADIANCE OF SOURCE UNDER STUDY 000002
 00132 188* C REAL TEMP(340,2) @ TEMPORARY STORAGE FOR ELAMBDA AND FILTER DATA 000002
 00133 189* C REAL LLAMBD(340,2) @ SPECTRAL RADIANCE OF SOURCE UNDER STUDY 000002
 00134 190* C REAL ERETLB(340,3) @ SPECTRAL-RETINAL IRRADIANCE FOR 3 AND 7-MM PUPIL 000002
 00135 191* C REAL BLURAD @BLUE LIGHT RADIANCE 000002
 00136 192* C REAL EDELLB @ TOTAL SPECTRAL IRRADIANCE OF SOURCE 000002
 00137 193* C REAL LDELLB @ TOTAL RADIANCE OF SOURCE 000002
 00140 194* C REAL ACGIH @ EFFECTIVE UV RADIATION ACCORDING TO THE
000002
 00140 195* C 000002
 00141 196* C REAL CIE @ EFFECTIVE UV RADIATION ACCORDING TO THE
000002
 00141 197* C 000002
 00142 198* C REAL ANSI @ EFFECTIVE UV RADIATION ACCORDING TO THE
000002
 00142 199* C REAL BLUHAZ @ BLUE LIGHT HAZARD FUCTION WEIGHTED AGAINST
SPECTRAL IRRADIANCE 000002
 00143 200* C 000002
 00143 201* C 000002
 00144 202* C REAL XBAR @ 1931 BLUE CHROMATICITY COORDINATES WEIGHTED
AGAINST SPECTRAL IRRADIANCE 000002
 00144 203* C 000002

00145	204*		REAL	YBAR	@ 1931 GREEN CHROMATICITY COORDINATES WEIGHTED AGAINST SPECTRAL IRRADIANCE	000002
00145	205*	C	REAL	ZBAR	@ 1931 RED CHROMATICITY COORDINATES WEIGHTED AGAINST SPECTRAL IRRADIANCE	000002
00146	206*		REAL	P445	@ DARTNELL NOMOGRAM ABSORPTION COEFFICIENT FOR BLUE WEIGHTED AGAINST SPECTRAL IRRADIANCE	000002
00146	207*	C	REAL	P535	@ DARTNELL NOMOGRAM ABSORPTION COEFFICIENT FOR GREEN WEIGHTED AGAINST SPECTRAL IRRADIANCE	000002
00147	208*		REAL	P575	@ DARTNELL NOMOGRAM ABSORPTION COEFFICIENT FOR RED WEIGHTED AGAINST SPECTRAL IRRADIANCE	000002
00147	209*	C	REAL	VE	@ RADIANT EFFACACY OF RADIATION FROM LAMBDA-MIN TO LAMBDA-MAX	000002
00150	210*		REAL	VIE	@ FRACTION CIE SCOTOPIC RADIATION FROM LAMBDA-MIN TO LAMBDA-MAX	000002
00150	211*	C	REAL	TRANS	@ EFFECTIVE TRANSMISSION OF OCULAR MEDIA FROM LAMBDA-MIN TO LAMBDA-MAX	000002
00151	212*		REAL	TRANTX	@ EFFECTIVE TRANSMISSION OF OCULAR MEDIA MULTIPLIED BY SPECTRAL ABSORPTION OF OCULAR MEDIA	000002
00152	213*	C	REAL	EECA	@ ANSI LASER MPE WEIGHTING FACTOR FOR VIS+BLE AND INFRARED-A	000002
00155	216*		REAL	PCTUV	@ PERCENT OF TOTAL IRRADIANCE WHICH IS UV RADIATION	000002
00155	217*	C	REAL	PCTVI	@ PERCENT OF TOTAL IRRADIANCE WHICH IS VISIBLE RADIATION	000002
00155	218*		REAL	PCTNIR	@ PERCENT OF TOTAL IRRADIANCE WHICH IS NEAR INFRARED RADIATION	000002
00156	219*	C	REAL	ILLUM	@ ILLUMINANCE IN LAMENS PER SQUARE CENTIMETER	000002
00163	220*		REAL	LUMIN	@ LUMINANCE IN CANDELAS PER SQUARE CENTIMETER	000002
00164	221*	C	REAL	DATA	@ INPUT BUFFER FOR TABLE DATA	000002
00165	222*		REAL	DATA1	@ INPUT BUFFER FOR TABLE DATA	000002
00166	223*	C	REAL	WAVE	@ WAVELENGTH ASSOCIATED WITH DATA AND DATA1	000002
00167	224*		REAL	FT1(340,2)	@ FILTER ONE DATA TABLE	000002
00170	225*	C	REAL	FT2(340,2)	@ FILTER TWO DATA TABLE	000002
00171	226*		REAL	FT3(340,2)		000002
00172	227*	C	REAL	EFT(340,4)	@SPECTRAL FILTER TRANSMISSION FOR FILTER ONE AND FILTER TWO AND FOR BOTH FILTERS	000002
00172	228*		REAL	FILTER(9)	@ EFFECTIVE UV IRRADIANCE ACCORDING TO THE THREE ACTION SPECTRA THROUGH EITHER FILTER OR BOTH FILTERS	000002
00173	229*	C	REAL	GLAMBD(340,2)	@ GENERAL WEIGHTING TABLE	000002
00174	230*		REAL	DELTA(340)	@ TABLE OF WAVE LENGTH INCREMENTS FOR EINSTR DATA	000002
00175	231*	C	REAL	PKCAL(340)	@CALIBRATION FOR PEAK SPECTRAL READINGS	000002
00176	232*		REAL	BW(340)	@BANDWIDTH OF MONOCHROMETER FOR PEAKS	000002
00177	233*	C	REAL	ELAMP(340,2)	@SPECTRAL IRRADIANCE VALUES FOR PLOT	000002
00200	234*		REAL	DELTAP(340)	@MEASUREMENT INTERVALS SENT TO HPLOT	000002
00201	235*	C	REAL	PREV	@ DURING INPUT OF READINGS,CONTAINS THE	000002
00202	236*		REAL	BWAV1,BWAV2	@WAVELENGTH REGIONS FOR BANDPASS VALUES VALUE OF THE LAST CARD READ	000002
00203	237*	C	REAL	CUV(340,2,3)	@ CALIBRATION FOR BOTH VISIBLE AND UV	000002
00204	238*		INTEGER	LAMBDA(3,2)		000002
00205	239*	C	INTEGER	FLTCNT(3,2)		000002
00206	240*		INTEGER	GENFUN	@ INDICATES WHETHER GENERAL FUNCTION DATA IS TO BE READ	000002
00207	241*	C	INTEGER	GENWEI	@ THE GENERAL WEIGHTING FUNCTION TO CALCULATE	000002
00210	242*		INTEGER	CALHDR(14)	@ DESCRIPTION OF CALIBRATION DATA	000002
00211	243*	C	INTEGER	CALUV(14)	@ DESCRIPTION OF UV CALIBRATION	000002
00212	244*		INTEGER	CALIR(14)	@ DESCRIPTION OF IR CALIBRATION DATA	000002
00213	245*	C	INTEGER			

00214	262*	INTEGER FILHDR(14)		000002
00215	263*	INTEGER FILHD2(14)		000002
00216	264*	INTEGER FILHD3(14)		000002
00217	265*	INTEGER LAMPHD(14)		000002
00220	266*	INTEGER LAMPUV(14)	• DESCRIPTION OF UV STANDARD LAMP	000002
00221	267*	INTEGER LAMPIR(14)	• DESCRIPTION OF IR STANDARD LAMP	000002
00222	268*	INTEGER DESCRP(28)	• DESCRIPTION OF SOURCE UNDER STUDY	000002
00223	269*	INTEGER NUMFIL	• NUMBER OF FILTER	000002
00224	270*	INTEGER NOCOF1	• NUMBER OF DATA FIELDS FOR FILTER ONE	000002
00225	271*	INTEGER NOCOF2	• NUMBER OF DATA FIELDS FOR FILTER TWO	000002
00226	272*	INTEGER GENERL		000002
00227	273*	INTEGER CALDAT	• INDICATES WHETHER CALIBRATION DATA WILL BE INPUT AS RAW DATA OR CALCULATED DATA	000002
00227	C 274*	INTEGER EVENT(3)	• EVENT NUMBER OF RUN DATA READINGS	000002
00230	275*	INTEGER EVENT2(12)		000002
00232	277*	INTEGER FVENT(6)		000002
00233	278*	INTEGER PAGE	• PAGE COUNT FOR LISTING	000002
00234	279*	INTEGER DATE(2)	• DATE OF THE RUN	000002
00235	280*	INTEGER ENDMK	• INDICATE WHETHER DATA SET WAS ENDED CORRECTLY	000002
00236	281*	INTEGER PRTLAM(23,3)	• USED IN LIST HEADING FOR GENERAL WEIGHTING FUNCTION COLUMN	000002
00236	C 282*	INTEGER LSTWAV	• CONTAINS LAST WAVE LENGTH DURING CALCULATIONS	000002
00240	284*	INTEGER PEAK	• INPUT THAT INDICATES WHETHER VALUE IS A PEAK VALUE	000002
00240	285*	C		000002
00241	286*	INTEGER SUPRES	• SUPPRESSES PLOT OF SOURCE SPECTRUM	000002
00242	287*	INTEGER STORE	• INDICATES WHICH DECK IS TO BE STORED STORE = 1 FILTER1 STORE = 2 FILTER2 STORE = 3 FILTER3 STORE = 4 EVENT STORE = 5 CALIBRATION STORE = 6 STANDARD LAMP	000002 000002 000002 000002 000002 000002 000002
00242	288*	C		000002
00242	289*	C		000002
00242	290*	C		000002
00242	291*	C		000002
00242	292*	C		000002
00242	293*	C		000002
00243	294*	INTEGER ASTR(340,4)• A	• INDICATES INTERPOLATED VALUES	000002
00244	295*	INTEGER PKCON	• INDICATES WHEN PEAKS ARE TO BE PRINTED	000002
00244	296*	C	PKCON=0 PRINTOUT HAS NOT REACHED PEAK VALUES	000002
00244	297*	C	PKCON=1 PRINTOUT HAS REACHED PEAKS BUT HEADING NOT PRINTED	000002
00244	298*	C	PKCON=2 PRINTOUT HAS PRINTED FIRST HEADING	000002
00244	299*	C	PKCON=3 PRINTOUT HAS REACHED PEAKS AND START NEW PAGE	000002
00244	300*	C		000002
00245	301*	REAL BANPAS(3)	• BAND PASS WITH USED WHEN COMPUTING WITH	000002
00245	302*	C	• PEAK VALUE	000002
00246	303*	INTEGER FWAVE		000002
00247	304*	DATA ((PRTLAM(I,J),J=1,3),I=1,19)/		000002
00247	305*	1' (NOT ','USED)		000002
00247	306*	2' (S-L','AMBDA')		000002
00247	307*	3' (U-L','AMBDA')		000002
00247	308*	4' (A-L','AMBDA')		000002
00247	309*	5' (T-L','AMBDA')		000002
00247	310*	6' (T-A-','LAMBDA')		000002
00247	311*	7' (C-A-','LAMBDA')		000002
00247	312*	8' (V-L','AMBDA')		000002
00247	313*	9' (V*-L','AMBDA')		000002
00247	314*	A' (B-L','AMBDA')		000002
00247	315*	B' (X-BAR','LAMBD',A)		000002
00247	316*	C' (Y-BAR','LAMBD',A)		000002
00247	317*	D' (Z-BAR','LAMBD',A)		000002
00247	318*	E' (P-','445)		000002
00247	319*	F' (P-','535)		000002

```

00247 320*      G' (P-1,'575) ', '
00247 321*      H' FIL','TER ON','E ', '
00247 322*      I' FIL','TER TW','O ', '
00247 323*      J' BOTH',' FILTE','RS ', '
00251 324*      DATA ((PRTLAM(I,J),J=1,3),I=20,23)/
00251 325*      1' FILTE', 'R THRE ', 'E ',
00251 326*      2' RADI', 'ANCE ', '
00251 327*      3'BLUE R','ADIANC','E',
00251 328*      4' CALIB','RATION', '
00253 329*      DATA (( LAMBDA(I,J),J=1,2),I=1,3)/
00253 330*      1 'S-LA', 'MBDA',
00253 331*      2 'U-LA', 'MBDA',
00253 332*      3 'A-LA', 'MBDA',
00255 333*      DATA ((FLTCNT(I,J),J=1,2),I=1,3)/
00255 334*      1 ' FILTE', 'R ONE',
00255 335*      2 ' FILTE', 'R TWO',
00255 336*      3 'BOTH F', 'ILTERS',
00257 337*      DATA EVENT2 / 'FIGURE', ' . A', 'BSOLUT', 'E SPEC', 'TRAL I',
00257 338*      1 'RRADIA', 'NCE AT', ' C', 'M FOR', ' ', ' ', ' /'
00261 339*      DATA IONE,ITWO,ITHREE,IFOUR/1,2,3,4/
00266 340*      2 CONTINUE
00267 341*      CALL INITIL
00270 342*      DP(1) = .09          • .3CM SQUARED
00271 343*      DP(2) = .49          • .7CM SQUARED
00272 344*      WAVE = 200
00272 345*      C
00272 346*      C INITIALIZE GENERAL FUNCTION TO UNITY. IF ANOTHER FUNCTION IS DESIRED
00272 347*      C IT WILL BE INPUT BY CARDS AND AFFECT ONLY THE SPECIFIED RANGES
00272 348*      C
00273 349*      DO 5 I = 1,240
00276 350*      FOFX(I,1) = WAVE
00277 351*      FOFX(I,2) = 1
00300 352*      WAVE = WAVE + 5
00301 353*      5 CONTINUE
00301 354*      C
00301 355*      C READ SOURCE DESCRIPTION
00301 356*      C
00303 357*      READ 10,(DESCRP(I),I=1,14)
00306 358*      GO TO 4
00307 359*      3 READ(0,10) (DESCRP(I),I=15,28)
00312 360*      10 FORMAT(13A6,A2)
00312 361*      C
00312 362*      C READ CALCULATION CONTROL CARD
00312 363*      C
00313 364*      4 READ(5,30,ERR=3) NUMFIL,NOCOF1,NOCOF2,NOCOF3,CALDAT,GENWEI,GENFUN,
00313 365*      1FLPLOT,STORE,IOS,SUPRES,LINLOG,SUMRY
00313 366*      C LINLOG = 1 LINEAR PLOTS ONLY
00313 367*      C LINLOG = 2 LOG PLOTS ONLY
00313 368*      C LINLOG = 0 BOTH PLOTS
00332 369*      30 FORMAT(5I1,I2,7I1)
00333 370*      IF(NOCOF1.EQ.0)NOCOF1 = 1
00335 371*      IF(NOCOF2.EQ.0)NOCOF2 = 1
00337 372*      IF(NOCOF3.EQ.0) NOCOF3=1
00337 373*      C
00337 374*      C READ THE CALIBRATION DATA
00337 375*      C
00341 376*      READ 40,DFU,DFV,BANPAS(1),BWA1,BANPAS(2),BWA2,BANPAS(3)
00352 377*      40 FORMAT(7F4.0)

```

B-11

```

00353 378* IF(BANPAS(1).EQ.0) BANPAS(1)=3.0          000114
00355 379* IF(BWAV1.EQ.0.) BWAV1=400                000120
00357 380* IF(BANPAS(2).EQ.0.) BANPAS(2)=5.0          000124
00361 381* IF(BWAV2.EQ.0.) BWAV2=700                000130
00363 382* IF(BANPAS(3).EQ.0.) BANPAS(3)=10.0         000134
00365 383* IF(DFU.EQ.0) DFU=1.0                      000140
00367 384* IF(DFV.EQ.0) DFV=1.0                      000144
00371 385* ITCAL=CALDAT+1                         000150
00372 386* GO TO (45,130,126,2100,2200,2100,2200), ITCAL 000153
00372 387* C
00372 388* C 45-- CALIBRATION IS RAW, CF IS TO BE CALCULATED. 000153
00372 389* C 130- CALIBRATION IS PRE-CALCULATED.        000153
00372 390* C 126- CALIBRATION IS ALL ONE'S, PROGRAM GENERATES TABLE. 000153
00372 391* C 2100 -- CALIBRATION IS RAW WITH OVERLAP REGION(S) 000153
00372 392* C 2200 -- CALIBRATION IS COMPUTED WITH OVERLAP REGION(S) 000153
00372 393* C
00373 394* 45 READ 35,CALHDR                         000153
00376 395* 35 FORMAT(13A6,A2)                      000170
00377 396* IF(CALHDR.EQ.'SAME') GO TO 170           000176
00401 397* IF(STORE.EQ.5) WRITE(25,35) CALHDR       000176
00401 398* C
00401 399* C THE CALIBRATION INPUT IS THE RAW DATA AND CF MUST BE COMPUTED 000201
00405 400* DO 60 I = 1,341                         000201
00410 401* READ(5,50,ERR=70) CF(I,1),CF(I,2)       000217
00414 402* 50 FORMAT(F4.0,T9,E9.2)                 000232
00415 403* 55 FORMAT(F5.0,T9,E9.2,T20,A4)        000232
00416 404* 60 CONTINUE                           000232
00420 405* 70 READ(0,80) ENDMK                     000232
00423 406* 80 FORMAT(A3)                          000237
00424 407* IF(ENDMK .EQ. 'END') GOTO 100          000237
00426 408* PRINT 90                                000242
00430 409* 90 FORMAT('0','CALIBRATION DATA NOT ENDED CORRECTLY') 000246
00431 410* READ (0,35) CALHDR                   000246
00434 411* PRINT 35, CALHDR                    000256
00437 412* STOP                                 000265
00440 413* 100 READ 35,LAMPHD                  000270
00443 414* IF(STORE.EQ.6) WRITE(25,35) LAMPHD    000276
00447 415* DO 110 J=1,341                         000311
00452 416* READ(5,50,ERR=120) WAVE,DATA          000322
00456 417* IF (IFIX(WAVE+0.01) .EQ. IFIX(CF(J,1)+0.01)) GOTO 96 000332
00460 418* PRINT 95,WAVE                         000354
00463 419* 95 FORMAT('0 WAVE LENGTH ',F5.0,' OF SPECTRAL IRRADIANCE DOES', 000361
00463 420* 1 'NOT MATCH WAVE LENGTH OF READING FOR CALIBRATION', 000361
00463 421* 2 'FACTOR.')                         000361
00464 422* STOP                                 000361
00465 423* 96 IF(DATA .NE. 0) GOTO 98            000364
00467 424* PRINT 99,WAVE                         000365
00472 425* 99 FORMAT('0 DIVISION BY ZERO IN CALIBRATION FACTOR SECTION AT', 000372
00472 426* 1 'WAVE LENGTH ',F5.0)                 000372
00473 427* STOP                                 000372
00474 428* 98 IF(WAVE .GT. BWAV1) GOTO 97          000375
00476 429* CF(J,2) = CF(J,2) / DATA * DFU        000400
00477 430* GOTO 105                            000404
00500 431* CF(J,2) = CF(J,2) / DATA * DFV        000406
00501 432* 105 CONTINUE                         000412
00502 433* IF(STORE.EQ.6) WRITE(25,55) WAVE,DATA 000412
00507 434* IF(STORE.EQ.5) WRITE(25,55) CF(J,1),CF(J,2) 000422
00514 435* 110 CONTINUE                         000437

```

```

00516 436*      120 IF(I .EQ. J) GOTO 125          000437
00520 437*      PRINT 121                         000441
00522 438*      121 FORMAT('0 CALIBRATION FACTOR ERROR - NUMBER RAW DATA NOT MATCHED') 000445
00523 439*      STOP                            000445
00524 440*      125 READ(0,80) ENDMK             000450
00527 441*      IF(STORE.EQ.5.OR.STORE.EQ.6) WRITE(25,80) ENDMK        000455
00533 442*      MAXWAV=CF(J-1,1)                 000477
00534 443*      IF(ENDMK .EQ. 'END') GOTO 170       000507
00536 444*      PRINT 90                          000512
00540 445*      READ (0,35) CALHDR              000516
00543 446*      PRINT 35, CALHDR                000526
00546 447*      STOP                            000535
00546 448*      C GENERATE CF TABLE FROM 200-1400(WAVELENGTHS)--ALL VALUES = 1. 000535
00546 449*      126 CONTINUE                     000540
00547 450*      VAL=195                        000540
00550 451*      DO 127 I=1,341                  000544
00551 452*      CF(I,1)=VAL+5                  000544
00554 453*      CF(I,1)=VAL+5                  000546
00555 454*      VAL=CF(I,1)                   000546
00556 455*      CF(I,2)=1.0                   000547
00557 456*      127 CONTINUE                     000552
00561 457*      MAXWAV=1400                  000552
00562 458*      CF(I,2)=1.0                   000554
00563 459*      GO TO 170                      000555
00563 460*      C READ COMPUTED CALIBRATION DATA 000555
00563 461*      C READ COMPUTED CALIBRATION DATA 000555
00563 462*      C READ COMPUTED CALIBRATION DATA 000555
00564 463*      130 READ 35,CALHDR              000557
00567 464*      IF(CALHDR.EQ.'SAME') GO TO 170 000565
00571 465*      IF(STORE.EQ.5) WRITE(25,35) CALHDR 000570
00575 466*      DO 150 I = 1,341               000603
00600 467*      READ(5,140,ERR=160) (CF(I,J),J=1,2) 000615
00606 468*      140 FORMAT(F4.0,T9,E9.2)        000627
00607 469*      IF(CF(I,1) .GT. BWAV1) GOTO 135 000627
00611 470*      CF(I,2) = CF(I,2) * DFU        000633
00612 471*      IF(STORE.EQ.5) WRITE(25,55) CF(I,1),CF(I,2) 000636
00617 472*      GOTO 150                      000647
00620 473*      135 CF(I,2) = CF(I,2) * DFV        000651
00621 474*      IF(STORE.EQ.5) WRITE(25,55) CF(I,1),CF(I,2) 000653
00626 475*      150 CONTINUE                     000673
00630 476*      160 READ(0,80 ) ENDMK            000673
00633 477*      IF(STORE.EQ.5) WRITE(25,80) ENDMK 000700
00637 478*      MAXWAV=CF(I-1,1)                 000711
00640 479*      IF(ENDMK .EQ. 'END') GOTO 170       000721
00642 480*      PRINT 90                          000724
00644 481*      READ (0,35) CALHDR              000730
00647 482*      PRINT 35, CALHDR                000740
00652 483*      STOP                            000747
00652 484*      C READ UNCOMPUTED CALIBRATION IN TWO OR THREE DECKS 000747
00652 485*      C READ UNCOMPUTED CALIBRATION IN TWO OR THREE DECKS 000747
00652 486*      C READ UNCOMPUTED CALIBRATION IN TWO OR THREE DECKS 000752
00653 487*      2100 IVAL = 2                  000753
00654 488*      IF(CALDAT.EQ.5) IVAL = 3          000753
00656 489*      DO 2190 K=1,IVAL                000766
00661 490*      IF(K.EQ.1) READ 35,CALUV          000777
00665 491*      IF(CALUV.EQ.'SAME') GO TO 170 001011
00667 492*      IF (K.EQ.2) READ 35, CALHDR        001014
00673 493*      IF(K.EQ.3) READ 35,CALIR         001026

```

00677	494*	IF(STORE.EQ.5.AND.K.EQ.1) WRITE(25,35) CALUV	001040
00703	495*	IF(STORE.EQ.5.AND.K.EQ.2) WRITE(25,35) CALHDR	001057
00707	496*	IF(STORE.EQ.5.AND.K.EQ.3) WRITE (25,35) CALIR	001103
00713	497*	DO 2110 I=1,341	001133
00716	498*	2110 READ(5,50,ERR=2120) CUV(I,1,K),CUV(I,2,K)	001133
00723	499*	2120 READ(0,80) ENDMK	001147
00726	500*	IF(ENDMK.EQ.'END') GO TO 2130	001154
00730	501*	PRINT 90	001157
00732	502*	READ (0,35) CALHDR	001163
00735	503*	PRINT 35, CALHDR	001173
00740	504*	STOP	001202
00741	505*	2130 IF(K.EQ.1) READ 35,LAMPUV	001205
00745	506*	IF(K.EQ.2) READ 35,LAMPHD	001236
00751	507*	IF(K.EQ.3) READ 35, LAMPIR	001250
00755	508*	IF(STORE.EQ.6.AND.K.EQ.1) WRITE(25,35) LAMPUV	001262
00761	509*	IF(STORE.EQ.6.AND.K.EQ.2) WRITE(25,35) LAMPHD	001301
00765	510*	IF(STORE.EQ.6.AND.K.EQ.3) WRITE (25,35) LAMPIR	001325
00771	511*	DO 2160 J=1,341	001351
00774	512*	READ(5,50,ERR=2170) WAVE , DATA	001363
01000	513*	IF(IFIX(WAVE+0.01).EQ.IFIX(CUV(J,1,K)+0.01)) GO TO 2140	001373
01002	514*	PRINT 95, WAVE	001415
01005	515*	STOP	001422
01006	516*	2140 IF(DATA.NE.0) GO TO 2150	001425
01010	517*	PRINT 99,WAVE	001426
01013	518*	STOP	001433
01014	519*	2150 IF(K.EQ.1) CUV(J,2,K) = CUV(J,2,K) / DATA * DFU	001436
01016	520*	IF(K.GE.2) CUV(J,2,K) = CUV(J,2,K) / DATA * DFV	001443
01020	521*	IF(STORE.EQ.6) WRITE(25,55) WAVE,DATA	001451
01025	522*	IF(STORE.EQ.5) WRITE(25,55) CUV(J,1,K),CUV(J,2,K)	001462
01032	523*	2160 CONTINUE	001500
01034	524*	2170 IF(I.EQ.J) GO TO 2180	001500
01036	525*	PRINT 121	001502
01040	526*	STOP	001506
01041	527*	2180 READ(0,80) ENDMK	001511
01044	528*	IF(STORE.EQ.5.OR.STORE.EQ.6) WRITE(25,80) ENDMK	001516
01050	529*	IF(ENDMK.EQ.'END') GO TO 2190	001540
01052	530*	PRINT 90	001543
01054	531*	READ (0,35) CALHDR	001547
01057	532*	PRINT 35, CALHDR	001557
01062	533*	STOP	001566
01063	534*	2190 CONTINUE	001572
01065	535*	MAXWAV = CUV(J-1,1,K)	001572
01066	536*	GO TO 2300	001604
01066	537*	C	001604
01066	538*	READ REGULAR COMPUTED CALIBRATION IN TWO OR THREE DECKS	001604
01066	539*	C	001604
01067	540*	2200 IVAL=2	001606
01070	541*	IF(CALDAT.EQ.6) IVAL = 3	001607
01072	542*	DO 2230 K=1,IVAL	001622
01075	543*	IF(K.EQ.1) READ 35,CALUV	001650
01101	544*	IF(CALUV.EQ.'SAME') GO TO 170	001661
01103	545*	IF (K.EQ.2) READ 35, CALHDR	001664
01107	546*	IF(K.EQ.3) READ 35, CALIR	001676
01113	547*	IF(STORE.EQ.5.AND.K.EQ.1) WRITE(25,35) CALUV	001710
01117	548*	IF(STORE.EQ.5.AND.K.EQ.2) WRITE(25,35) CALHDR	001723
01123	549*	IF(STORE.EQ.5.AND.K.EQ.3) WRITE (25,35) CALIR	001747
01127	550*	DO 2210 I=1,341	001773
01132	551*	READ(5,140,ERR=2220) CUV(I,1,K), CUV(I,2,K)	002005

01136	552*	IF(K.EQ.1) CUV(I,2,K) = CUV(I,2,K) * DFU	002015
01140	553*	IF(K.GE.2) CUV(I,2,K) = CUV(I,2,K) * DFV	002022
01142	554*	IF(STORE.EQ.5) WRITE(25,55) CUV(I,1,K),CUV(I,2,K)	002027
01147	555*	2210 CONTINUE	002044
01151	556*	2220 READ(0,80) ENDMK	002044
01154	557*	IF(STORE.EQ.5) WRITE(25,80) ENDMK	002051
01160	558*	IF(ENDMK.EQ. 'END') GO TO 2230	002062
01162	559*	PRINT 90	002065
01164	560*	READ (0,35) CALHDR	002071
01167	561*	PRINT 35, CALHDR	002101
01172	562*	STOP	002110
01173	563*	2230 CONTINUE	002114
01175	564*	MAXWAV = CUV(I-1,1,K)	002114
01175	565*	C	002114
01175	566*	C FORM CALIBRATION DECK FROM TWO OR THREE DECKS	002114
01175	567*	C	002114
01176	568*	2300 IFLAG=0	002127
01177	569*	DO 2350 I=1,341	002127
01202	570*	IF(IFLAG.EQ.1) GO TO 2310	002144
01204	571*	IF(IFLAG.EQ.2) GO TO 2370	002147
01206	572*	CF(I,1) = CUV(I,1,1)	002152
01207	573*	CF(I,2) = CUV(I,2,1)	002154
01210	574*	IF(CF(I,1).GE.BWAV1) GO TO 2320	002156
01212	575*	GO TO 2350	002162
01213	576*	2310 CF(I,1) = CUV(J,1,2)	002164
01214	577*	CF(I,2) = CUV(J,2,2)	002166
01215	578*	IF(IVAL.EQ.3.AND.CF(I,1).GE.BWAV2) GO TO 2380	002170
01217	579*	IF(CUV(J,1,2).EQ.MAXWAV) GO TO 2360	002200
01221	580*	J=J+1	002202
01222	581*	GO TO 2350	002205
01223	582*	2370 CF(I,1) = CUV(J,1,3)	002207
01224	583*	CF(I,2) = CUV(J,2,3)	002211
01225	584*	IF(CUV(J,1,3).EQ.MAXWAV) GO TO 2360	002213
01227	585*	J = J + 1	002217
01230	586*	GO TO 2350	002222
01231	587*	2320 IFLAG = 1	002224
01232	588*	DO 2340 K=1,341	002230
01235	589*	IF(CF(I,1).GT.CUV(K,1,2)) GO TO 2340	002230
01237	590*	IF(CF(I,1).EQ.CUV(K,1,2)) GO TO 2330	002234
01241	591*	J=K	002237
01242	592*	GO TO 2350	002241
01243	593*	2330 J=K+1	002243
01244	594*	GO TO 2350	002245
01245	595*	2340 CONTINUE	002251
01247	596*	2380 IFLAG = 2	002251
01250	597*	DO 2385 K=1,341	002255
01253	598*	IF(CF(I,1).GT.CUV(K,1,3)) GO TO 2385	002255
01255	599*	IF(CF(I,1).EQ.CUV(K,1,3)) GO TO 2382	002261
01257	600*	J=K	002264
01260	601*	GO TO 2350	002266
01261	602*	2382 J = K + 1	002270
01262	603*	GO TO 2350	002272
01263	604*	2385 CONTINUE	002303
01265	605*	2350 CONTINUE	002303
01267	606*	2360 CONTINUE	002303
01270	607*	170 CONTINUE	002303
01270	608*	C READ BIDDECK	002303
01270	609*	C	002303

01270	610*	C		-002303
01271	611*	DO 190 I = 1,341		-002303
01274	612*	READ(5,180,ERR=200) WAVE,SLAMBD(I,2),ULAMBD(I,2),VLAMBD(I,2),		-002303
01274	613*	1VPLAMB(I,2),TLAMBD(I,2),TALAMB(I,2),CALAMB(I,2),ALAMBD(I,2)		-002303
01307	614*	180 FORMAT(F4.0,8E9.2)		002322
01310	615*	SLAMBD(I,1) = WAVE		002322
01311	616*	ULAMBD(I,1) = WAVE		002324
01312	617*	VLAMBD(I,1) = WAVE		002325
01313	618*	VPLAMB(I,1) = WAVE		002326
01314	619*	TLAMBD(I,1) = WAVE		002327
01315	620*	TALAMB(I,1) = WAVE		002330
01316	621*	CALAMB(I,1) = WAVE		002331
01317	622*	ALAMBD(I,1) = WAVE		002332
01320	623*	190 CONTINUE		002336
01322	624*	200 READ(0,210) ENDMK		002336
01325	625*	210 FORMAT(A3)		002343
01326	626*	IF(ENDMK .EQ. 'END') GOTO 230		002343
01330	627*	PRINT 220,I		002346
01333	628*	220 FORMAT('0','BIDDECK HAS NO END CARD AT IMAGE ',I3)		002353
01334	629*	STOP		002353
01335	630*	230 CONTINUE		002356
01335	631*	C		002356
01335	632*	C		002356
01336	633*	CALL BOREAD(BLAMBD)		002356
01337	634*	CALL BOREAD(XBLAMB)		002360
01340	635*	CALL BOREAD(YBLAMB)		002363
01341	636*	CALL BDREAD(ZBLAMB)		002366
01342	637*	CALL BDREAD(P445LB)		002371
01343	638*	CALL BDREAD(P535LB)		002374
01344	639*	CALL BDREAD(P575LB)		002377
01344	640*	C		002377
01344	641*	C READ FILTER TRANSMISSION FUNCTION(S), IF ANY		002377
01344	642*	C FILTER ONE DATA IS READ FIRST.		002377
01344	643*	C		002377
01345	644*	I = NUMFIL + 1		002402
01346	645*	GO TO (450,290,290,290),I		002405
01346	646*	C		002405
01346	647*	C DETERMINE NUMBER OF DATA FIELDS FOR FILTER ONE		002405
01346	648*	C		002405
01347	649*	290 GOTO(300,360),NOCOF1		002417
01347	650*	C		002417
01347	651*	C ONE DATA FIELD FOR FILTER ONE		002417
01347	652*	C		002417
01350	653*	300 READ 35,FILHDR		002426
01353	654*	IF(STORE.EQ.1) WRITE(25,35) FILHDR		002434
01357	655*	DO 320 I = 1,341		002447
01362	656*	READ(5,310,ERR=330)(FT1(I,K),K=1,2)		002461
01370	657*	IF(STORE.EQ.1) WRITE(25,55) (FT1(I,K),K=1,2)		002473
01377	658*	310 FORMAT(F4.0,T9,E9.2)		002523
01400	659*	320 CONTINUE		002523
01402	660*	330 READ(0,340) ENDMK		002523
01405	661*	IF(STORE.EQ.1) WRITE(25,340) ENDMK		002530
01411	662*	340 FORMAT(A3)		002543
01412	663*	FT1(I,1)=1405		002543
01413	664*	IF(ENDMK.EQ.'END') GO TO 385		002548
01415	665*	345 PRINT 350		002552
01417	666*	350 FORMAT('0','FILTER DATA WAS NOT ENDED CORRECTLY')		002555
01420	667*	READ (0,35) CALHDR		002555

01423 668* PRINT 35, CALHDR 002565
 01426 669* STOP 002574
 01426 670* C 002574
 01426 671* C TWO DATA FIELDS FOR FILTER ONE 002574
 01426 672* C 002574
 01427 673* 360 READ 35,FILHDR 002577
 01432 674* IF(STORE.EQ.1) WRITE(25,35) FILHDR 002605
 01436 675* DO 380 I = 1,341 002620
 01441 676* READ(5,370,ERR=330) FT1(I,1),DATA,DATA1 002631
 01446 677* 370 FORMAT(F4.0,T9.2E9.2) 002642
 01447 678* FT1(I,2) = DATA / DATA1 002642
 01450 679* IF(STORE.EQ.1) WRITE(25,55) (FT1(I,K),K=1,2) 002645
 01457 680* 380 CONTINUE 002671
 01461 681* GOTO 345 002671
 01461 682* C 002671
 01461 683* C DETERMINE NUMBER OF DATA FIELDS FOR FILTER TWO 002671
 01461 684* C 002671
 01462 685* 385 GOTO(450,390,390),NUMFIL 002673
 01463 686* 390 GOTO(400,430),NOCOF2 002703
 01463 687* C 002703
 01463 688* C ONE DATA FIELD FOR FILTER TWO 002703
 01463 689* C 002703
 01464 690* 400 READ 35,FILHD2 002712
 01467 691* IF(STORE.EQ.2) WRITE(25,35) FILHD2 002720
 01473 692* DO 410 I = 1,341 002733
 01478 693* READ(5,310,ERR=420)(FT2(I,K),K=1,2) 002745
 01504 694* IF(STORE.EQ.2) WRITE(25,55) (FT2(I,K),K=1,2) 002757
 01513 695* 410 CONTINUE 003006
 01515 696* GOTO 345 003006
 01518 697* 420 READ(0,340) ENDMK 003010
 01521 698* IF(STORE.EQ.2) WRITE(25,340) ENDMK 003015
 01525 699* FT2(I,1)=1405 003030
 01526 700* IF(ENDMK .EQ. 'END') GOTO 441 003033
 01530 701* GOTO 345 003036
 01530 702* C 003036
 01530 703* C TWO DATA FIELDS FOR FILTER TWO 003036
 01530 704* C 003036
 01531 705* 430 READ 35,FILHD2 003040
 01534 706* IF(STORE.EQ.2) WRITE(25,35) FILHD2 003046
 01540 707* DO 440 I = 1,341 003061
 01543 708* READ(5,370,ERR=420) FT2(I,1),DATA,DATA1 003072
 01550 709* FT2(I,2) = DATA / DATA1 003103
 01551 710* IF(STORE.EQ.2) WRITE(25,55) (FT2(I,K),K=1,2) 003106
 01560 711* 440 CONTINUE 003132
 01562 712* GOTO 345 003132
 01562 713* C 003132
 01562 714* C DETERMINE NUMBER OF DATA FIELDS FOR FILTER THREE 003132
 01562 715* C 003132
 01563 716* 441 GO TO(450,450,445),NUMFIL 003134
 01564 717* 445 GO TD(442,447),NOCOF3 003144
 01564 718* C 003144
 01564 719* C ONE DATA FIELD FOR FILTER THREE 003144
 01564 720* C 003144
 01565 721* 442 READ 35,FILHD3 003153
 01570 722* IF(STORE.EQ.3) WRITE(25,35) FILHD3 003161
 01574 723* DO 443 I=1,341 003174
 01577 724* READ(5,310,ERR=444)(FT3(I,K),K=1,2) 003206
 01605 725* IF(STORE.EQ.3) WRITE(25,55) (FT3(I,K),K=1,2) 003220

01614	726*	443 CONTINUE	003247
01616	727*	GO TO 345	003247
01617	728*	444 READ(0,340) ENDMK	003251
01622	729*	IF(STORE.EQ.3) WRITE(25,340) ENDMK	003256
01626	730*	FT3(I,1)=1405	003271
01627	731*	IF(ENDMK.EQ.'END') GO TO 450	003274
01631	732*	GO TO 345	003277
01631	733*	C	003277
01631	734*	C TWO DATA FIELDS FOR FILTER THREE	003277
01632	735*	447 READ 35,FILHD3	003301
01635	736*	IF(STORE.EQ.3) WRITE(25,35) FILHD3	003307
01641	737*	DO 448 I=1,341	003322
01644	738*	READ(5,370,ERR=444) FT3(I,1),DATA,DATA1	-003333
01651	739*	FT3(I,2)=DATA/DATA1	003344
01652	740*	IF(STORE.EQ.3) WRITE(25,55) (FT3(I,K),K=1,2)	003347
01661	741*	448 CONTINUE	-003373
01663	742*	GO TO 345	-003373
01664	743*	450 CALL IDENT	003375
01664	744*	C	003375
01664	745*	C READ GENERAL FUNCTION, INPUT CONTAINS THE FIRST AND LAST WAVE LENGTH	003375
01664	746*	C AFFECTED BY FUNCTION	003375
01664	747*	C	003375
01665	748*	IF(GENFUN .EQ. 0) GOTO 520	003376
01667	749*	DO 470 I=1,341	-003403
01672	750*	READ(5,460,ERR=480) FWAVE,LWAVE,DATA	-003403
01677	751*	PRINT 451, FWAVE,LWAVE,DATA	003414
01704	752*	451 FORMAT('0',20X,I4.5X,I4.5X,G10.3)	-003423
01705	753*	460 FORMAT(I4,T10,I4,T20,E9.2)	-003423
01705	754*	C	003423
01705	755*	C DETERMINE THE TABLE ELEMENT NUMBERS FOR THE WAVE LENGTH INTERVALS	-003423
01705	756*	C	-003423
01706	757*	J = (FWAVE - 200) / 5 + 1	-003423
01707	758*	K = (LWAVE - 200) / 5 + 1	003431
01707	759*	C	003431
01707	760*	C INSERT THE FUNCTION INTO THE CORRECT ELEMENTS OF THE GENERAL FUNCTION	003431
01707	761*	C TABLE	003431
01707	762*	C	003431
01710	763*	DO 465 L = J,K	003437
01713	764*	FOFX(L,2) = DATA	003444
01714	765*	465 CONTINUE	003450
01716	766*	470 CONTINUE	003450
01720	767*	GO TO 500	003450
01721	768*	480 READ(0,490) ENDMK	003452
01724	769*	490 FORMAT(A3)	003457
01725	770*	IF(ENDMK.EQ.'END') GO TO 520	003457
01727	771*	500 PRINT 510	-003463
01731	772*	510 FORMAT('0','INCORRECT GENERAL FUNCTION CARD')	003466
01732	773*	READ (0,35) CALHDR	003466
01735	774*	PRINT 35, CALHDR	003476
01740	775*	STOP	003505
01741	776*	520 CONTINUE	003510
01741	777*	C	003510
01741	778*	C READ SPECTRAL DATA OF SOURCE UNDER STUDY	003510
01741	779*	C	003510
01741	780*	C READ THE EVENT NUMBER OF THE DATA	003510
01741	781*	C	003510
01742	782*	530 READ(5,540,END=9999)EVENT,FIG,CM	003510
01747	783*	540 FORMAT(3A6,1X,A2,3X,A5)	-003523

B
-19

```

01750 784*      GO TO 542          .003523
01751 785*      541 READ(0,10)  (DESCRP(I),I=15,28)    003525
01754 786*      542 CONTINUE        003535
01754 787*      C
01755 788*      IF (EVENT(1) .EQ. 'NEXT') GO TO 2       003535
01757 789*      IF(STORE.EQ.4) WRITE(25,540) EVENT,FIG,CM   003537
01757 790*      C      READ SOURCE SOLID ANGLE        003537
01757 791*      C
01765 792*      READ(5,550,ERR=541) OMEGA             003555
01770 793*      IF(STORE.EQ.4) WRITE(25,550) OMEGA         003564
01774 794*      550 FORMAT(E9.2)           003575
01775 795*      IF(EVENT(1).NE.'BLACK'.OR.EVENT(3).NE.'BB') GO TO 545 003575
01777 796*      EVENT(3)=' '
02000 797*      READ 544,T           003611
02003 798*      544 FORMAT(F6.0)           003620
02004 799*      CALL BLKBDY(ELAMBO,DELTA,T)        003620
02005 800*      GO TO 3700          003625
02006 801*      545 CONTINUE        003627
02006 802*      C
02006 803*      C      READ THE DATA READINGS      003627
02006 804*      C
02007 805*      PREV = 0            003630
02010 806*      DO 570 I = 1,341        003636
02013 807*      555 READ(5,560,ERR=580) (EINSTR(I,K),K=1,2),PEAK 003636
02022 808*      560 FORMAT(F4.0,T9,E9.2,T20,A4)        003655
02022 809*      C
02022 810*      C      IF PRESENT WAVE LENGTH IS LESS THAN OR EQUAL TO THE PREVIOUS WAVE 003655
02022 811*      C      LENGTH DISREGARD IT AND READ THE NEXT CARD      003655
02022 812*      C
02023 813*      IF(MAXWAV.LT.EINSTR(I,1)) GO TO 563        003655
02025 814*      IF(PREV .LT. EINSTR(I,1)) GOTO 561        003661
02027 815*      IF(ABS(PREV).EQ.EINSTR(I,1).AND.(PREV.LT.0.OR.PEAK.EQ.'PEAK')) 003665
02027 816*      1 GO TO 561          003665
02031 817*      563 PRINT 562,(EINSTR(I,K),K=1,2)        003711
02037 818*      562 FORMAT(' SOURCE DATUM DISREGARDED - ',F4.0,E9.2) 003724
02040 819*      GOTO 555          003724
02041 820*      561 PREV = EINSTR(I,1)        003726
02042 821*      IF(PEAK.EQ.'PEAK'.AND.PREV.LT.0) PRINT 6650 003727
02045 822*      6650 FORMAT(' TWO PEAKS IN SEQUENCE OR SPECTRUM BEGINS WITH PEAK --- ', 003747
02045 823*      1'PROBABLE ERROR')          003747
02046 824*      IF(PEAK.EQ.'PEAK'.AND.I.EQ.1) PRINT 6650 003747
02046 825*      C
02046 826*      C      IF THE VALUE IS A PEAK VALUE THEN NEGATE THE WAVE LENGTH TO INDICATE 003747
02046 827*      C      THAT THE VALUE ASSOCIATED WITH THIS WAVE LENGTH IS A PEAK VALUE 003747
02046 828*      C
02051 829*      IF(PEAK .EQ. 'PEAK') EINSTR(I,1) = EINSTR(I,1) * (-1) 003767
02053 830*      570 CONTINUE        003777
02055 831*      580 READ(0,590) ENDMK        003777
02060 832*      590 FORMAT(A3)           004004
02061 833*      IF(ENDMK .EQ. 'END') GOTO 620        004004
02063 834*      600 PRINT 610          004007
02065 835*      610 FORMAT('0','SPECTRAL READINGS WERE NOT ENDED CORRECTLY') 004013
02066 836*      READ (0,35) CALHDR        004013
02071 837*      PRINT 35, CALHDR        004023
02074 838*      STOP              004032
02075 839*      620 CONTINUE        004035
02076 840*      MAXELM=I-1        004035
02076 841*      C

```

```

02076 842* C COMPUTE THE DELTA ASSOCIATED WITH EACH WAVE LENGTH. THIS IS DONE 004035
02076 843* C IN THE FOLLOWING WAY: 004035
02076 844* C 004035
02076 845* C 1) DETERMINE THE DELTA FOR THE FIRST WAVE LENGTH. IF THE WAVE 004035
02076 846* C LENGTH IS LESS THAN ZERO, IT IT A PEAK AND DELTA IS SET TO CORRECT 004035
02076 847* C BANPAS VALUE. IF IT IS NOT A PEAK THEN DELTA EQUALS ONE HALF OF 004035
02076 848* C THE DIFFERENCE BETWEEN THE FIRST TWO CONSECUTIVE NON-PEAK WAVE 004035
02076 849* C LENGTHS 004035
02076 850* C 004035
02076 851* C 2) COMPUTE THE REST OF THE DELTAS. PEAK VALUES GET THE CORRECT 004035
02076 852* C BANPAS VALUE. FOR NON-PEAK VALUES, MUST KEEP TRACK OF LAST 004035
02076 853* C NON-PEAK WAVE LENGTH AND THE WAVE LENGTH INTERVAL, ALSO MUST 004035
02076 854* C KNOW IF THE LAST VALUE WAS A PEAK THAT FELL ON A WAVE INTERVAL 004035
02076 855* C WHICH WILL BE TREATED HAS A NON-PEAK FOR THE NEXT NON-PEAK DELTA 004035
02076 856* C VALUE. SO DELTA FOR NON PEAK VALUE IS THE DIFFERENCE BETWEEN 004035
02076 857* C THE PRESENT WAVE LENGTH AND THE PREVIOUS NON-PEAK WAVE LENGTH. 004035
02076 858* C 004035
02077 859* C IF(EINSTR(1,1).LT.0) GOTO 623 004037
02101 860* C DIV = 2 004042
02102 861* C WAVE1 = EINSTR(1,1) 004044
02103 862* C LMN = 3 004046
02104 863* C WAVE2 = EINSTR(2,1) 004050
02105 864* C IJK = 2 004052
02106 865* C 619 DO 621 I = LMN,MAXELM 004055
02111 866* C IF(WAVE1 .GT. 0 .AND. WAVE2 .GT. 0) GOTO 622 004061
02113 867* C WAVE1 = WAVE2 004075
02114 868* C WAVE2 = EINSTR(I,1) 004077
02115 869* C 621 CONTINUE 004104
02115 870* C 004104
02115 871* C COME HERE WHEN TWO CONSECUTIVE NON PEAK VALUES ARE FOUND AND COMPUTE 004104
02115 872* C DELTA FOR FIRST NON-PEAK VALUE 004104
02115 873* C 004104
02117 874* C 622 DELTA(IJK-1) =(WAVE2 - WAVE1) / DIV 004104
02120 875* C LSTWAV = EINSTR(IJK-1,1) * LAST NON-PEAK WAVE LENGTH 004110
02121 876* C INTVL = DELTA(IJK-1) * DIV * INTERVAL BETWEEN 2 CONSECUTIVE NON-PEAKS 004117
02122 877* C GOTO 626 004127
02122 878* C 004127
02122 879* C FIRST VALUE IS A PEAK SO DO LOOP UNTIL A NON-PEAK VALUE IS FOUND 004127
02122 880* C BW = BAND WIDTH OF MONOCHROMATOR 004127
02122 881* C 004127
02123 882* C 623 DO 624 J = 1,MAXELM 004131
02126 883* C BW(J)=BANPAS(1) 004135
02127 884* C IF(ABS(EINSTR(J,1)).GT.BWAV1) BW(J)=BANPAS(2) 004137
02131 885* C IF(ABS(EINSTR(J,1)).GT.BWAV2) BW(J)=BANPAS(3) 004145
02133 886* C IF(EINSTR(J+1,1).GT.0) GO TO 625 004153
02135 887* C 624 CONTINUE 004160
02137 888* C GO TO 631 004160
02140 889* C 625 DIV = 1 004162
02141 890* C IJK = J+2 004163
02142 891* C WAVE 1 = EINSTR(J+1,1) 004166
02143 892* C WAVE2 = EINSTR(J+2,1) 004171
02144 893* C LMN = J + 3 004173
02145 894* C GOTO 619 004176
02145 895* C 004176
02145 896* C PROGRAM GOT HERE AFTER IT HAS DETERMINE DELTA FOR THE FIRST NON-PEAK 004176
02145 897* C VALUE AND ANY PEAK VALUE THAT WAS BEFORE IT 004176
02145 898* C 004176
02146 899* C 626 DO 629 I = IJK,MAXELM 004200

```

02151	900*	IF(EINSTR(I,1)) 627,631,628	004204
02151	901*	C	004204
02151	902*	C PRESENT VALUE IS A PEAK, IF PEAK IS ON A NON-PEAK INTERVAL THEN	004204
02151	903*	C PEAK WAVE BECOMES LAST WAVE LENGTH	004204
02151	904*	C	004204
02154	905*	627 IF (EINSTR(I,1) = LSTWAV .EQ. INTVL) LSTWAV = EINSTR(I,1)	004207
02156	906*	BW(I)=BANPAS(1)	004226
02157	907*	IF(ABS(EINSTR(I,1)).GT.BWAV1) BW(I)=BANPAS(2)	004230
02161	908*	IF(ABS(EINSTR(I,1)).GT.BWAV2) BW(I)=BANPAS(3)	004236
02163	909*	GOTO 629	004244
02163	910*	C	004244
02163	911*	C PRESENT VALUE IS NON-PEAK	004244
02163	912*	C	004244
02164	913*	628 DELTA(I) = EINSTR(I,1) - LSTWAV	004246
02165	914*	LSTWAV = EINSTR(I,1)	004252
02166	915*	INTVL = DELTA(I)	004261
02167	916*	629 CONTINUE	004273
02171	917*	631 CONTINUE	-004273
02171	918*	C	-004273
02171	919*	C CALCULATION SECTION FOLLOWS	-004273
02171	920*	C	-004273
02171	921*	C	-004273
02171	922*	C IT IS NOT NECESSARY THAT THE WAVE LENGTH INTERVAL OF THE SPECTRAL	004273
02171	923*	READINGS OR ANY OF INTERMEDIATE VALUES CORRESPOND TO THE WAVE	004273
02171	924*	LENGTH INTERVAL OF THE BIOLOGICAL DATA AND THE CALIBRATION DATA.	004273
02171	925*	C IT IS THEREFORE NECESSARY IN EACH CALCULATION SECTION TO MATCH UP	004273
02171	926*	BIO AND CAL DATA WITH THE CORRESPONDING SPECTRAL AND INTERMEDIATE	004273
02171	927*	RESULTS DATA. IF SPECTRAL READING FALL BETWEEN BIO DATA AND CAL	004273
02171	928*	DATA THEN THE BIO AND CAL DATA WILL HAVE TO BE INTERPOLATED FOR	004273
02171	929*	THE WAVE LENGTH OF SPECTRAL DATA.DUE TO THE FACT THAT THE PROGRAM	004273
02171	930*	NEGATES THE WAVE LENGTH OF PEAK READINGS IT IS NECESSARY WHEN	004273
02171	931*	COMPARING WAVE LENGTHS TO USE THE ABSOLUTE VALUE OF THE WAVE	004273
02171	932*	LENGTH FOR SPECTRAL READING DATA	004273
02171	933*	C	004273
02171	934*	C CALCULATE ADJUSTED INSTRUMENT READINGS	004273
02171	935*	C	004273
02172	936*	K = 1	004274
02173	937*	DO 640 I = 1,MAXELM	004302
02176	938*	633 IF(FOFX(K,1) .EQ. ABS(EINSTR(I,1))) GOTO 630	004302
02200	939*	IF(ABS(EINSTR(I,1)) .LT. FOFX(K,1)) GOTO 638	004305
02202	940*	K = K + 1	004311
02203	941*	GOTO 633	004314
02204	942*	638 EIFOFX(I,1)=EINSTR(I,1)	004316
02205	943*	EIFOFX(I,2) = EINSTR(I,2) * FOFX(K-1,2)	004317
02206	944*	GOTO 640	004323
02207	945*	630 EIFOFX(I,1)=EINSTR(I,1)	004325
02210	946*	EIFOFX(I,2) = EINSTR(I,2) * FOFX(K,2)	004326
02211	947*	K = K + 1	004332
02212	948*	640 CONTINUE	004337
02212	949*	C	004337
02212	950*	C CALCULATE SPECTRAL IRRADIANCE OF SOURCE UNDER STUDY	004337
02212	951*	C	004337
02214	952*	K = 1	004337
02215	953*	DO 690 I = 1,MAXELM	004345
02220	954*	645 IF(ABS(EIFOFX(I,1)) .NE. CF(K,1)) GOTO 680	004345
02222	955*	IF(CF(K,2) .NE. 0) GOTO 670	004350
02224	956*	650 EPRINT=ABS(EIFOFX(I,1))	004353
02225	957*	PRINT 660,EPRINT	004354

```

02230 958*      660 FORMAT('0 ATTEMPT TO DIVIDE A CALIBRATION FACTOR OF ZERO INTO ADJU
02230 959*          1STEP INSTRUMENT READING AT WAVE LENGTH ',F5.0)          004361
02231 960*          STOP                                              004361
02232 961*          670 ELAMBD(I,1) = EIFOFX(I,1)                                004364
02233 962*          ELAMBD(I,2) = EIFOFX(I,2) / CF(K,2)                      004366
02234 963*          K = K + 1                                         004371
02235 964*          GOTO 690                                         004374
02236 965*          680 IF(ABS(EIFOFX(I,1)) .LT. CF(K,1)) GOTO 685          004376
02240 966*          K = K + 1                                         004402
02241 967*          GOTO 645                                         004405
02242 968*          685 IF(K.EQ.1) GO TO 690                                004407
02244 969*          CALL INTERP(EIFOFX,CF,I,K,CALFAC)                  004411
02245 970*          IF(CALFAC .EQ. 0) GOTO 650                      004420
02247 971*          ELAMBD(I,1) = EIFOFX(I,1)                                004422
02250 972*          ELAMBD(I,2) = EIFOFX(I,2) / CALFAC                  004424
02251 973*          690 CONTINUE
02253 974*          IF(STORE.NE.4) GO TO 687
02255 975*          DO 688 I=1,MAXELM
02260 976*          PEAK=' '
02261 977*          IF(ELAMBD(I,1).LT.0) PEAK='PEAK'                    004442
02263 978*          X=ABS(ELAMBD(I,1))                                004447
02264 979*          WRITE(25,55) X,ELAMBD(I,2),PEAK                   004451
02271 980*          688 CONTINUE
02273 981*          ENDMK='END'
02274 982*          WRITE(25,80) ENDMK
02277 983*          687 CONTINUE
02277 984*          C
02277 985*          C   INTERPOLATE VALUES OF SPECTRAL IRRADIANCE TO INSURE
02277 986*          C   VALUES EVERY 5 NM.
02277 987*          C
02300 988*          IF(IOS.NE.1) GO TO 3700
02302 989*          L=0
02303 990*          MXMIN1=MAXELM-1
02304 991*          DO 694 J=1,MXMIN1
02307 992*          L=L+1
02310 993*          DO 691 K=1,2
02313 994*          TEMP(L,K)=ELAMBD(J,K)
02314 995*          691 CONTINUE
02316 996*          692 CONTINUE
02317 997*          JPLUS1=J+1
02320 998*          XPRS1=ABS(ELAMBD(JPLUS1,1))-ABS(TEMP(L,1))
02321 999*          LMIN1=L-1
02322 1000*          IF(TEMP(L,1).LT.0) XPRS1=ABS(ELAMBD(JPLUS1,1))-ABS(TEMP(LMIN1,1))
02324 1001*          IF(XPRS1.LE.5) GD TD 693
02326 1002*          LPLUS1=L+1
02327 1003*          IXPRS=INT(ABS(TEMP(L,1))/5)
02330 1004*          IF(TEMP(L,1).LT.0) IXPRS=INT(ABS(TEMP(LMIN1,1))/5)
02332 1005*          TEMP(LPLUS1,1)=5*(IXPRS+1.0)
02333 1006*          ASTR(LPLUS1,1)='*'
02334 1007*          CALL INTERP(TEMP,ELAMBD,LPLUS1,JPLUS1,Z)
02335 1008*          TEMP(LPLUS1,2)=Z
02336 1009*          L=LPLUS1
02337 1010*          GO TD 692
02340 1011*          693 CONTINUE
02341 1012*          694 CONTINUE
02343 1013*          LPLUS1=L+1
02344 1014*          DO 695 K=1,2
02347 1015*          TEMP(LPLUS1,K)=ELAMBD(MAXELM,K)

```

```

02350 1016*      695 CONTINUE                               .004673
02352 1017*      DO 697 I=1,LPLUS1                      .004673
02355 1018*      DO 696 J=1,2                          .004673
02360 1019*      ELAMBD(I,J)=TEMP(I,J)                  .004673
02361 1020*      TEMP(I,J)=0.                           .004674
02362 1021*      696 CONTINUE                               .004702
02364 1022*      697 CONTINUE                               .004702
02366 1023*      MAXELM=LPLUS1                         .004702
02367 1024*      CALL ADJUST(EINSTR)                   .004704
02370 1025*      CALL ADJUST(EIFOFX)                   .004707
02371 1026*      CALL DELSUB(ELAMBD,DELTA,BW)           .004712
02372 1027*      3700 CONTINUE                               .004720
02372 1028*      C
02372 1029*      C      CALCULATE SPECTRAL RADIANCE OF SOURCE UNDER STUDY .004720
02372 1030*      C
02373 1031*      DO 700 I = 1,MAXELM                     .004720
02376 1032*      LLAMBD(I,1) = ELAMBD(I,1)                 .004725
02377 1033*      LLAMBD(I,2) = ELAMBD(I,2) / OMEGA          .004726
02400 1034*      700 CONTINUE                               .004732
02400 1035*      C
02400 1036*      C      CALCULATE SPECTRAL-RETINAL IRRADIANCE FOR 3-MM AND 7-MM PUPILS .004732
02400 1037*      C
02402 1038*      K = 1                                     .004732
02403 1039*      DO 750 I = 1,MAXELM                     .004741
02406 1040*      705 IF(ABS(LLAMBD(I,1)) .NE. TLAMBD(K,1)) GOTO 720 .004741
02410 1041*      ERETLB(I,1) = ABS(LLAMBD(I,1))            .004744
02411 1042*      J = 2                                     .004751
02412 1043*      DO 710 L = 1,2                         .004757
02415 1044*      ERETLB(I,J) = .27 * LLAMBD(I,2) * TLAMBD(K,2) * DP(L) .004761
02416 1045*      J = J + 1                                .004764
02417 1046*      710 CONTINUE                            .004770
02421 1047*      K = K + 1                                .004770
02422 1048*      GOTO 750                                .004773
02423 1049*      720 IF(ABS(LLAMBD(I,1)) .LT. TLAMBD(K,1)) GOTO 730 .004775
02425 1050*      K = K + 1                                .005001
02426 1051*      GOTO 705                                .005004
02427 1052*      730 CONTINUE                            .005006
02430 1053*      CALL INTERP(LLAMBD,TLAMBD,I,K,TLRES)     .005006
02431 1054*      ERETLB(I,1) = ABS(LLAMBD(I,1))            .005017
02432 1055*      J = 2                                     .005021
02433 1056*      DO 740 L = 1,2                         .005027
02436 1057*      ERETLB(I,J) = .27 * LLAMBD(I,2) * TLRES * DP(L) .005031
02437 1058*      J = J + 1                                .005034
02440 1059*      740 CONTINUE                            .005043
02442 1060*      750 CONTINUE                            .005043
02442 1061*      C
02442 1062*      C      CALCULATE SPECTRAL FILTER TRANSMISSION FOR ONE FILTER .005043
02442 1063*      C
02444 1064*      IF(NUMFIL) 830,830,755                .005043
02447 1065*      755 J=1                                 .005046
02450 1066*      DO 780 I=1,MAXELM                     .005055
02453 1067*      IFLAG=0                                .005055
02454 1068*      EFT(I,2)=SEQUEN(ELAMBD,I,FT1,J)*ELAMBD(I,2) .005056
02455 1069*      IF(IFLAG.EQ.1) ASTR(I,2)='*'           .005066
02457 1070*      EFT(I,1)=ELAMBD(I,1)                  .005073
02460 1071*      780 CONTINUE                            .005077
02460 1072*      C
02460 1073*      C

```

```

02460 1074* C      CALCULATE SPECTRAL FILTER TRANSMISSION FOR TWO FILTER          005077
02460 1075* C      GO TO(830,785,785),NUMFIL                                     005077
02462 1076*          785 J=1                                         005077
02463 1077*          DO 800 I=1,MAXELM                                    005110
02464 1078*          IFLAG=0                                         005111
02467 1079*          EFT(I,3)=SEQUEN(ELAMBD,I,FT2,J)*ELAMBD(I,2)           005116
02470 1080*          IF(IFLAG.EQ.1) ASTR(I,3)='*'                         005117
02471 1081*          IF(NUMFIL.EQ.3) GO TO 800                           005127
02473 1082*          EFT(I,4)=EFT(I,3)*EFT(I,2)/ELAMBD(I,2)             005134
02475 1083*          IF( ASTR(I,2).EQ.'*'.OR.ASTR(I,3).EQ.'*') ASTR(I,4)='*' 005137
02476 1084*          IF( ASTR(I,2).EQ.'*'.OR.ASTR(I,3).EQ.'*') ASTR(I,4)='*' -005143
02500 1085*          800 CONTINUE                                         005163
02500 1086*          C
02500 1087*          C
02500 1088*          C      CALCULATE SPECTRAL FILTER TRANSMISSION FOR THIRD FILTER 005163
02500 1089*          C
02502 1090*          GO TO(830,830,795),NUMFIL                                     005163
02503 1091*          795 J=1                                         005174
02504 1092*          DO 810 I=1,MAXELM                                    005175
02507 1093*          IFLAG=0                                         005202
02510 1094*          EFT(I,4)=SEQUEN(ELAMBD,I,FT3,J)*ELAMBD(I,2)           005203
02511 1095*          IF(IFLAG.EQ.1) ASTR(I,4)='*'                         005213
02513 1096*          B10 CONTINUE                                         005223
02513 1097*          C
02515 1098*          830 CONTINUE                                         005223
02516 1099*          ITEST = 0                                         005223
02517 1100*          GO TO 1045                                         005223
02520 1101*          1041 DO 1141 II = 1,MAXELM                                    005225
02523 1102*          1141 ELAMBD(II,2) = EFT(II,2)                         005231
02525 1103*          ITEST = 1                                         005233
02526 1104*          GO TO 1045                                         005235
02527 1105*          1042 DO 1142 II = 1,MAXELM                                    005237
02532 1106*          1142 ELAMBD(II,2) = EFT(II,3)                         005243
02534 1107*          ITEST = 2                                         005245
02535 1108*          GO TO 1045                                         005247
02536 1109*          1043 DO 1143 II = 1,MAXELM                                    005251
02541 1110*          1143 ELAMBD(II,2) = EFT(II,4)                         005255
02543 1111*          ITEST = 3                                         005257
02543 1112*          C
02543 1113*          C      DETERMINE IF A GENERAL WEIGHTING TABLE IS TO BE CALCULATED 005257
02543 1114*          C
02544 1115*          1045 GENERL = GENWEI + 1                                     005262
02545 1116*          GOTO(860,870,880,890,900,910,920,930,940,950,960,970,980,990,1000, 005264
02545 1117*          1,1010,1011,1012,1013,1014,1015,1018), GENERL               005264
02546 1118*          860 GOTO 1020 @ DO NOT CALCULATE TABLE                   005321
02547 1119*          870 CALL GLAMCO(GLAMBD,ELAMBD,SLAMBD,$1020)            005322
02550 1120*          880 CALL GLAMCO(GLAMBD,ELAMBD,ULAMBD,$1020)            005330
02551 1121*          890 CALL GLAMCO(GLAMBD,ELAMBD,ALAMBD,$1020)            005336
02552 1122*          900 CALL GLAMCO(GLAMBD,ELAMBD,TLAMBD,$1020)            005344
02553 1123*          910 CALL GLAMCO(GLAMBD,ELAMBD,TALAMB,$1020)            005352
02554 1124*          920 CALL GLAMCO(GLAMBD,ELAMBD,CALAMB,$1020)            005360
02555 1125*          930 CALL GLAMCO(GLAMBD,ELAMBD,VLAMBD,$1020)            005366
02556 1126*          940 CALL GLAMCO(GLAMBD,ELAMBD,VPLAMB,$1020)            005374
02557 1127*          950 CALL GLAMCO(GLAMBD,ELAMBD,BLAMBD,$1020)            005402
02560 1128*          960 CALL GLAMCO(GLAMBD,ELAMBD,XBLAMB,$1020)            005410
02561 1129*          970 CALL GLAMCO(GLAMBD,ELAMBD,YBLAMB,$1020)            005416
02562 1130*          980 CALL GLAMCO(GLAMBD,ELAMBD,ZBLAMB,$1020)            005424
02563 1131*          990 CALL GLAMCO(GLAMBD,ELAMBD,P445LB,$1020)            005432

```

02564 1132* 1000 CALL GLAMCO(GLAMBD,ELAMBD,P535LB,\$1020) 005440
 02565 1133* 1010 CALL GLAMCO(GLAMBD,ELAMBD,P575LB,\$1020) 005446
 02566 1134* 1011 CALL FSUB(GLAMBD,ELAMBD,EFT,ITWO,\$1020) 005454
 02567 1135* 1012 CALL FSUB(GLAMBD,ELAMBD,EFT,ITHREE,\$1020) 005463
 02570 1136* 1013 CALL FSUB(GLAMBD,ELAMBD,EFT,IFOUR,\$1020) 005472
 02571 1137* 1014 CALL RAD(GLAMBD,LLAMBD,\$1020) 005501
 02572 1138* 1015 CALL GLAMCO(GLAMBD,ELAMBD,BLAMBD,\$1016) 005506
 02573 1139* 1016 DO 1017 I=1,MAXELM 005514
 02576 1140* 1017 GLAMBD(I,2)=GLAMBD(I,1)/OMEGA 005520
 02600 1141* 1018 CALL RAD(GLAMBD,CF,\$1020) 005524
 02601 1142* 1020 CONTINUE 005531
 02602 1143* DO 1040 I = 1,MAXELM 005531
 02605 1144* IF (EINSTR(I,1)) 1030,1040,1040 005535
 02610 1145* 1030 ELAMBD(I,1) = EINSTR(I,1) 005537
 02611 1146* LLAMBD(I,1) = EINSTR(I,1) 005540
 02612 1147* 1040 CONTINUE 005543
 02612 1148* C 005543
 02612 1149* C CALCULATE TOTAL SPECTRAL IRRADIANCE FOR WAVE LIMITS USED FOR 005543
 02612 1150* C INSTRUMENT READINGS 005543
 02612 1151* C 005543
 02614 1152* L = 1 005543
 02615 1153* EDELLB = SUM1(ELAMBD,DELTA,L,MAXELM,BW) 005545
 02615 1154* C 005545
 02615 1155* C CALCULATE RADIANCE OF SOURCE FROM LAMBDA-MIN TO LAMBDA-MAX 005545
 02615 1156* C 005545
 02616 1157* C LDELLB = EDELLB/OMEGA 005555
 02616 1158* C 005555
 02616 1159* C CALCULATE EFFECTIVE ULTRAVIOLET RADIATION ACCORDING TO THE ACGIH 005555
 02616 1160* C STANDARD ACTION SPECTRUM 005555
 02616 1161* C 005555
 02617 1162* C ACGIH = SUM(ELAMBD,SLAMBD,DELTA,BW) 005557
 02617 1163* C 005557
 02617 1164* C CALCULATE EFFECTIVE ULTRAVIOLET RADIATION ACCORDING TO THE 1936 CIE 005557
 02617 1165* C ULTRAVIOLET ERYTHEMA ACTION SPECTRUM 005557
 02617 1166* C 005557
 02620 1167* C CIE = SUM(ELAMBD,ULAMBD,DELTA,BW) 005566
 02620 1168* C 005566
 02620 1169* C CALCULATE EFFECTIVE ULTRAVIOLET RADIATION ACCORDING TO THE ANSI-Z136 005566
 02620 1170* C LASER WEIGHTING UV HAZARD FUNCTION 005566
 02620 1171* C 005566
 02621 1172* C ANSI = SUM(ELAMBD,ALAMBD,DELTA,BW) 005575
 02621 1173* C 005575
 02621 1174* C CALCULATE BLUE LIGHT HAZARD FUNCTION WEIGHTED AGAINST SPECTRAL IRRADIANCE 005575
 02621 1175* C 005575
 02622 1176* C BLUHAZ = SUM(ELAMBD,BLAMBD,DELTA,BW) 005604
 02622 1177* C 005604
 02622 1178* C CALCULATE BLUE LIGHT RADIANCE 005604
 02622 1179* C 005604
 02623 1180* C BLURAD = BLUHAZ / DMEGA 005613
 02623 1181* C 005613
 02623 1182* C BLUE, GREEN, RED 1931 CHROMATICITY COORDINATES WEIGHTED AGAINST 005613
 02623 1183* C SPECTRAL IRRADIANCE 005613
 02623 1184* C 005613
 02624 1185* C XBAR = SUM(ELAMBD,XBLAMB,DELTA,BW) 005615
 02625 1186* C YBAR = SUM(ELAMBD,YBLAMS,DELTA,BW) 005624
 02626 1187* C ZBAR = SUM(ELAMBD,ZBLAMB,DELTA,BW) 005633
 02626 1188* C 005633
 02626 1189* C DARTNALL NOMOGRAM ABSORPTION COEFFICIENT FOR BLUE, GREEN, RED 005633

02626	1190*	C	WEIGHTED AGAINST SPECTRAL IRRADIANCE	-005633
02626	1191*	C		-005633
02627	1192*		P445 = SUM(ELAMBD,P445LB,DELTA,BW)	005642
02630	1193*		P535 = SUM(ELAMBD,P535LB,DELTA,BW)	005651
02631	1194*		P575 = SUM(ELAMBD,P575LB,DELTA,BW)	005660
02631	1195*	C		005660
02631	1196*	C	CALCULATE RADIANT EFFACACY OF RADIATION FROM LAMBDA-MIN TO LAMBDA-MAX	005660
02631	1197*	C		005660
02632	1198*	C	VE = 680 * SUM(ELAMBD,VLAMBD,DELTA,BW) / EDELLB	005667
02632	1199*	C		005667
02632	1200*	C	CALCULATE FRACTION CIE SCOTOPIC RADIATION FROM LAMBDA-MIN TO LAMBDA-MAX	005667
02632	1201*	C		005667
02633	1202*	C	VIE = SUM(ELAMBD,VPLAMB,DELTA,BW) / EDELLB	005700
02633	1203*	C		005700
02633	1204*	C	CALCULATE EFFECTIVE TRANSMISSION OF OCULAR MEDIA FROM MIN TO MAX LAMBDA	005700
02633	1205*	C		005700
02634	1206*		TRANS = SUM(ELAMBD,TLAMBD,DELTA,BW) / EDELLB	005710
02634	1207*	C		005710
02634	1208*	C	CALCULATE EFFECTIVE TRANSMISSION OF OCULAR MEDIA MULTIPLIED BY	005710
02634	1209*	C	SPECTRAL ABSORPTION OF OCULAR MEDIA	005710
02634	1210*	C		005710
02635	1211*		TRANTX = SUM(ELAMBD,TALAMB,DELTA,BW) / EDELLB	005720
02635	1212*	C		005720
02635	1213*	C	CALCULATE ANSI LASER MPE WEIGHTING FACTOR FOR VISIBLE AND INFRARED-A	005720
02635	1214*	C		005720
02636	1215*		EECA = SUM(ELAMBD,CALAMB,DELTA,BW) / EDELLB	005730
02637	1216*		ILLUM = EDELLB * VE	005740
02640	1217*		LUMIN = ILLUM / OMEGA	005743
02640	1218*	C		005743
02640	1219*	C	CALCULATE PERCENT OF TOTAL IRRADIANCE WHICH IS ULTRAVIOLET RADIATION	005743
02641	1220*		L = 1	005745
02642	1221*		I = 0	005747
02643	1222*		PCTUV = 0	005750
02644	1223*		IF(ELAMBD(1,1) .GT. 400) GOTO 1070	005751
02646	1224*		DO 1050 I = 1,MAXELM	005762
02651	1225*		IF(ELAMBD(I,1) .GT. 400) GOTO 1060	005762
02653	1226*		1050 CONTINUE	005771
02655	1227*		1060 IF(ELAMBD(I,1) .GT. 400) I = I - 1	005771
02657	1228*		PCTUV = 100 * SUM1(ELAMBD,DELTA,L,I,BW) / EDELLB	006002
02660	1229*		1070 CONTINUE	006015
02660	1230*	C		006015
02660	1231*	C	CALCULATE PERCENT OF TOTAL IRRADIANCE WHICH IS VISIBLE RADIATION	006015
02660	1232*	C		006015
02661	1233*		IF(I .EQ. MAXELM) GOTO 1110	006015
02663	1234*		MINELM = I + 1	006017
02664	1235*		IF(MINELM .LE. 1) MINELM = 1	006022
02666	1236*		PCTVI = 0	006032
02667	1237*		IF(ELAMBD(I,1) .GT. 700) GOTO 1100	006033
02671	1238*		DO 1080 I = MINELM,MAXELM	006045
02674	1239*		IF(ELAMBD(I,1) .GT. 700) GOTO 1090	006045
02676	1240*		1080 CONTINUE	006054
02700	1241*		1090 IF(ELAMBD(I,1) .GT. 700) I = I - 1	006054
02702	1242*		PCTVI = 100 * SUM1(ELAMBD,DELTA,MINELM,I,BW) / EDELLB	006065
02703	1243*		1100 CONTINUE	006100
02703	1244*	C		006100
02703	1245*	C	CALCULATE PERCENT OF TOTAL IRRADIANCE WHICH IS NEAR INFRARED	006100
02703	1246*	C		006100
02704	1247*		IF(I ,EQ. MAXELM) GOTO 1110	006100

B-27

```
02706 1248*      MINELM = I + 1                               006102
02707 1249*      IF(MINELM .LE. 1) MINELM = 1                 006105
02711 1250*      PCTNIR = 0                                006113
02712 1251*      PCTNIR= 100 * SUM1(ELAMBD,DELTA,MINELM,MAXELM,BW) / EDELLB 006114
02713 1252*      1110 IF(IEST.NE.0)GO TO 1330                006127
02715 1253*      1330 CONTINUE                            006131
02716 1254*      IF(SUPRES.GT.0.AND.IEST.EQ.0) GO TO 1980    006131
02716 1255*      C                                         006131
02716 1256*      C                                         ****
02720 1257*      DO 1310 I=1,6                                006145
02723 1258*      1310 FVENT(I)=' '
02725 1259*      IF(IEST.GT.0) FVENT(1)='WITH'               006147
02727 1260*      NNTEs = ITEST + 1                           006154
02730 1261*      GO TO (1321,1322,1323,1324),NNTEs            006157
02731 1262*      1322 FVENT(2)=FILHDR(1)                  006171
02732 1263*      FVENT(3)=' FILTE'                         006172
02733 1264*      FVENT(4)='R'                            006174
02734 1265*      GO TO 1321                            006176
02735 1266*      1323 FVENT(2)=FILHD2(1)                 006200
02736 1267*      FVENT(3)=' FILTE'                         006201
02737 1268*      FVENT(4)='R'                            006203
02740 1269*      GO TO 1321                            006205
02741 1270*      1324 CONTINUE                            006207
02742 1271*      IF(NUMFIL.EQ.3) GO TO 1325                006207
02744 1272*      FVENT(4)=FILHD2(1)                  006211
02745 1273*      FVENT(6)='RS'                            006213
02746 1274*      FVENT(3)=' AND'                          006215
02747 1275*      FVENT(2)=FILHDR(1)                  006217
02750 1276*      FVENT(5)=' FILTE'                         006221
02751 1277*      GO TO 1321                            006223
02752 1278*      1325 FVENT(2)=FILHD3(1)                 006225
02753 1279*      FVENT(3)=' FILTE'                         006226
02754 1280*      FVENT(4)='R'                            006230
02754 1281*      C                                         006230
02754 1282*      C                                         006230
02755 1283*      1321 XMIN=1000.                            006233
02756 1284*      DO 1336 I=1,MAXELM                   006234
02761 1285*      IF(ELAMBD(I,2).GT.1.OE-20)XMIN=AMIN1(XMIN,ELAMBD(I,2)) 006241
02763 1286*      1336 CONTINUE                            006254
02765 1287*      IMIN= ALOG10(XMIN)                      006254
02766 1288*      IF(IMIN.LT.0) IMIN=IMIN-1                006266
02770 1289*      XMIN=10.0**IMIN                         006274
02770 1290*      C                                         006274
02771 1291*      J=0                                     006301
02772 1292*      I=0                                     006302
02773 1293*      1905 I=I+1                                006304
02774 1294*      IF(I.GT.MAXELM) GO TO 1910                006306
02776 1295*      IF(ELAMBD(I,1).GT.0) GO TO 1909                006312
03000 1296*      IFIRST=ABS(ELAMBD(I,1))-ELAMBD(I-1,1) 006316
03001 1297*      ISEC=ELAMBD(I+1,1)-ABS(ELAMBD(I,1)) 006327
03002 1298*      IF(I.EQ.MAXELM) ISEC=1000                006341
03004 1299*      IF(I.EQ.1) IFIRST=1000                  006346
03006 1300*      IF(IFIRST.GT.ISEC) GO TO 1915 @ ADD TO SECOND VALUE 006353
03006 1301*      C                                         006353
03006 1302*      C     ADD TO FIRST VALUE                  006353
03010 1303*      ELAMP(J,2)=ELAMBD(I-1,2)+ELAMBD(I,2)*BW(I)/DELTA(I-1) 006360
03011 1304*      GO TO 1905                            006366
03011 1305*      C                                         006366
```

```

03012 1306*      1915 CONTINUE                               006370
03012 1307*      C   ADD TO SECOND VALUE                   006370
03012 1308*      C
03013 1309*          J=J+1                                006370
03014 1310*          ELAMP(J,1)=ELAMBD(I+1,1)           006372
03015 1311*          ELAMP(J,2)=ELAMBD(I+1,2)+ELAMBD(I,2)*BW(I)/DELTA(I+1) 006376
03016 1312*          DELTAP(J)=DELTA(I+1)                 006403
03017 1313*          I=I+1                                006405
03020 1314*          GO TO 1905                            006410
03020 1315*      C
03021 1316*          1909 J=J+1                                006412
03022 1317*          ELAMP(J,1)=ELAMBD(I,1)               006416
03023 1318*          ELAMP(J,2)=ELAMBD(I,2)               006420
03024 1319*          DELTAP(J)=DELTA(I)                  006422
03025 1320*          GO TO 1905                            006424
03025 1321*      C
03026 1322*          1910 CONTINUE                         006426
03026 1323*      C   ****
03026 1324*      C
03027 1325*          IDELTA = IFIX(DELTAP(2))            006426
03030 1326*          WRITE(15,1331) EVENT,J,IDEHLTA,FIG,CM,FVENT 006436
03040 1327*          1331 FORMAT(3A6,14,I2,A2,A5,6A6)        006462
03041 1328*          DO 1333 I = 1,J                      006462
03041 1329*      C   ELAMBD(I,1) - WAVELENGTH - X AXIS       006462
03044 1330*          WRITE(15,1332) ELAMP(I,1)             006462
03047 1331*          1332 FORMAT(F5.0)                  006473
03050 1332*          1333 CONTINUE                         006473
03052 1333*          DO 1335 I = 1,J                      006473
03055 1334*          IF(ELAMP(I,2).LE.1.0E-20) ELAMP(I,2)=XMIN 006473
03055 1335*      C   ELAMBD(I,2) - IRRADIANCE - Y AXIS       006473
03057 1336*          WRITE(15,1334) ELAMP(I,2)             006500
03062 1337*          1334 FORMAT(E9.4)                  006507
03063 1338*          1335 CONTINUE                         006507
03065 1339*          IF(I TEST.NE.0)GO TO 1515            006507
03065 1340*      C   ****
03065 1341*      C
03065 1342*      C
03067 1343*          1980 CONTINUE                         006512
03070 1344*          IF(FLPLOT .EQ.0) GO TO 1339            006512
03072 1345*          DO 1990 I=1,MAXELM                  006521
03075 1346*          1990 GLAMBD(I,1)=EINSTR(I,1)           006521
03077 1347*          2000 XMIN=1000.                     006523
03100 1348*          DO 2010 I=1,MAXELM                  006530
03103 1349*          IF(GLAMBD(I,2).GT.1.0E-20)XMIN=AMIN1(XMIN,GLAMBD(I,2)) 006530
03105 1350*          2010 CONTINUE                         006543
03107 1351*          IMIN=ALOG10(XMIN)                  006543
03110 1352*          IF(IMIN.LT.0) IMIN=IMIN-1            006555
03112 1353*          XMIN=10.0**IMIN                  006563
03112 1354*      C
03113 1355*          J=0                                006563
03114 1356*          I=0                                006570
03115 1357*          2020 I=I+1                            006571
03116 1358*          IF(I.GT.MAXELM) GO TO 2050            006573
03120 1359*          IF(GLAMBD(I,1).GT.0) GO TO 2040            006600
03122 1360*          IF(GENWEI.GT.15.AND.GENWEI.LT.20) GO TO 2020 006605
03124 1361*          IFIRST=ABS(GLAMBD(I,1))-GLAMBD(I-1,1) 006623
03125 1362*          ISEC=GLAMBD(I+1,1)-ABS(GLAMBD(I,1)) 006634
03126 1363*          IF(I.EQ.MAXELM) ISEC=1000              006646

```

१८

```

03130 1364* IF(I.EQ.1) IFIRST=1000
03132 1365* IF(IFIRST.GT.ISEC) GO TO 2030  PADD TO SECOND VALUE
03132 1366* C
03132 1367* C ADD TO FIRST VALUE
03134 1368* ELAMP(J,2)=GLAMBD(I-1,2)+GLAMBD(I,2)*BW(I)/DELTA(I-1)
03135 1369* GO TO 2020
03135 1370* C
03136 1371* 2030 CONTINUE
03136 1372* C ADD TO SECOND VALUE
03136 1373* C
03137 1374* J=J+1
03140 1375* ELAMP(J,1)=GLAMBD(I+1,1)
03141 1376* ELAMP(J,2)=GLAMBD(I+1,2)+GLAMBD(I,2)*BW(I)/DELTA(I+1)
03142 1377* DELTAP(J)=DELTA(I+1)
03143 1378* I=I+1
03144 1379* GO TO 2020
03144 1380* C
03144 1381* C NO CHANGE
03144 1382* C
03145 1383* 2040 J=J+1
03146 1384* ELAMP(J,1)=GLAMBD(I,1)
03147 1385* ELAMP(J,2)=GLAMBD(I,2)
03150 1386* DELTAP(J)=DELTA(I)
03151 1387* GO TO 2020
03151 1388* C
03152 1389* 2050 CONTINUE
03152 1390* C
03152 1391* C ****
03152 1392* C
03153 1393* IX=GENWEI + 1
03154 1394* IF(NUMFIL.EQ.3.AND.GENWEI.EQ.18) IX=20
03156 1395* IDELTA = IFIX(DELTAP(2))
03157 1396* FVENT(1) ='GLAMBO'
03160 1397* WRITE(15,1331) EVENT, J, IDELTA, FIG, CM, FVENT(1),
03160 1398* 1 (PRTLAM(IX,I),I=1,3)
03174 1399* DO 2060 I=1,J
03177 1400* WRITE(15,1332) ELAMP(I,1)
03202 1401* 2060 CONTINUE
03202 1402* C
03204 1403* DO 2070 I=1,J
03207 1404* IF(ELAMP(I,2).LE.1.0E-20) ELAMP(I,2)=XMIN
03211 1405* WRITE(15,1334) ELAMP(I,2)
03214 1406* 2070 CONTINUE
03216 1407* 1339 CONTINUE
03216 1408* C
03216 1409* C ****
03216 1410* C
03216 1411* C PRINT THE TABLE DATA---MUST DETERMINE IF THERE IS FILTER DATA AND
03216 1412* C IF THERE IS A GENERAL WEIGHTING DATA TO BE PRINTED AND IF FILTER
03216 1413* C DATA IS TO BE PRINTED WHETHER IT IS ONE OR TWO FILTERS
03216 1414* C
03217 1415* CALL DATEIM(DATE)
03220 1416* IF(SUMRY.GT.0) GO TO 1515
03222 1417* PKCON=0
03223 1418* PEAK = 0
03224 1419* PAGE = 0
03225 1420* LYNE=58
03226 1421* LINMAX = 57

```

03227	1422*	MX=MAXELM+1	007062
03230	1423*	K = 1	007065
03231	1424*	IF(GENWEI .GT. 0) K = 2	007067
03233	1425*	K = K + NUMFIL * 2	007074
03234	1426*	IF(NUMFIL.EQ.3) K=K-2	007100
03236	1427*	GOTO(1340,1370,1400,1430,1460,1490),K	007106
03236	1428*	C	007106
03236	1429*	C PRINT TABLE WITH NO GENERAL WEIGHTING AND NO FILTER DATA	007106
03236	1430*	C	007106
03237	1431*	1340 L=0	007122
03240	1432*	K=1	007122
03241	1433*	DO 1360 I = 1,MAXELM	007131
03244	1434*	CFRES = SEQUEN(EINSTR,I,CF,K)	007131
03245	1435*	IF(EINSTR(I,1).GT.0) GO TO 1345	007140
03247	1436*	L=L+1	007143
03250	1437*	ML=MAXELM+L	007146
03251	1438*	EINSTR(ML,1)=ABS(EINSTR(I,1))	007151
03252	1439*	PKCAL(ML)=CFRES	007153
03253	1440*	EINSTR(ML,2)=EINSTR(I,2)	007154
03254	1441*	EIFOFX(ML,2)=EIFOFX(I,2)	007156
03255	1442*	ELAMBD(ML,2)=ELAMBD(I,2)	007160
03256	1443*	LLAMBD(ML,2)=LLAMBD(I,2)	007162
03257	1444*	ERETLB(ML,2)=ERETLB(I,2)	007164
03260	1445*	ERETLB(ML,3)=ERETLB(I,3)	007166
03261	1446*	GO TO 1360	007170
03262	1447*	1345 CALL PRTCON	007172
03263	1448*	PRINT 1350,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),	007173
03263	1449*	1ASTR(I,1),	007173
03263	1450*	1 LLAMBD(I,2),ERETLB(I,2),ERETLB(I,3)	007173
03276	1451*	1350 FORMAT('0',T2,F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,3(1PE9.4,2X))	007212
03277	1452*	1360 CONTINUE	007212
03301	1453*	IF(L.EQ.0) GO TO 1366	007212
03303	1454*	PKCON=1	007214
03304	1455*	DO 1365 I=MX,ML	007223
03307	1456*	CALL PRTCON	007223
03310	1457*	PRINT 1350,EINSTR(I,1),PKCAL(I),EINSTR(I,2),ASTR(I,1),EIFOFX(I,2),	007225
03310	1458*	1ELAMBD(I,2),LLAMBD(I,2),ERETLB(I,2),ERETLB(I,3)	007225
03323	1459*	1365 CONTINUE	007245
03325	1460*	1366 CONTINUE	007245
03326	1461*	GOTO 1515	007245
03326	1462*	C	007245
03326	1463*	C PRINT TABLE WITH GENERAL WEIGHTING DATA, NO FILTER DATA	007245
03326	1464*	C	007245
03327	1465*	1370 L=0	007246
03330	1466*	K=1	007246
03331	1467*	DO 1390 I = 1,MAXELM	007255
03334	1468*	CFRES = SEQUEN(EINSTR,I,CF,K)	007255
03335	1469*	IF(EINSTR(I,1).GT.0) GO TO 1375	007264
03337	1470*	L=L+1	007267
03340	1471*	ML=MAXELM+L	007272
03341	1472*	EINSTR(ML,1)=ABS(EINSTR(I,1))	007275
03342	1473*	PKCAL(ML)=CFRES	007277
03343	1474*	EINSTR(ML,2)=EINSTR(I,2)	007300
03344	1475*	EIFOFX(ML,2)=EIFOFX(I,2)	007302
03345	1476*	ELAMBD(ML,2)=ELAMBD(I,2)	007304
03346	1477*	LLAMBD(ML,2)=LLAMBD(I,2)	007306
03347	1478*	ERETLB(ML,2)=ERETLB(I,2)	007310
03350	1479*	ERETLB(ML,3)=ERETLB(I,3)	007312

B-31

```

03351 1480*      GLAMBD(ML,2)=GLAMBD(I,2)          007314
03352 1481*      GO TO 1390                      007316
03353 1482*      1375 CALL PRTCON                 007320
03354 1483*      PRINT 1380,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),
03354 1484*      1ASTR(I,1),
03354 1485*      1 LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2)          007321
03372 1486*      1380 FORMAT('0',T2,F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,4(1PE9.4,2X)) 007351
03373 1487*      1390 CONTINUE                  007351
03375 1488*      IF(L.EQ.0) GO TO 1396          007351
03377 1489*      PKCON=1                     007353
03400 1490*      DO 1395 I=MX,ML            007366
03403 1491*      CALL PRTCON                 007366
03404 1492*      PRINT 1380,EINSTR(I,1),PKCAL(I),EINSTR(I,2),EIFOFX(I,2),
03404 1493*      1ELAMBD(I,2),ASTR(I,1),LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2) 007370
03422 1494*      1395 CONTINUE                  007417
03424 1495*      1396 CONTINUE                  007417
03425 1496*      GOTO 1515                   007417
03425 1497*      C                         007417
03425 1498*      C      PRINT TABLE WITH ONE FILTER AND NO GENERAL WEIGHTING DATA 007417
03425 1499*      C                         007417
03426 1500*      1400 L=0                     007420
03427 1501*      K=1                     007420
03430 1502*      DO 1420 I = 1,MAXELM        007427
03433 1503*      CFRES = SEQUEN(EINSTR,I,CF,K)          007427
03434 1504*      IF(EINSTR(I,1).GT.0) GO TO 1405          007436
03436 1505*      L=L+1                   007441
03437 1506*      ML=MAXELM+L          007444
03440 1507*      EINSTR(ML,1)=ABS(EINSTR(I,1))          007447
03441 1508*      PKCAL(ML)=CFRES          007451
03442 1509*      EINSTR(ML,2)=EINSTR(I,2)          007452
03443 1510*      EIFOFX(ML,2)=EIFOFX(I,2)          007454
03444 1511*      ELAMBD(ML,2)=ELAMBD(I,2)          007456
03445 1512*      LLAMBD(ML,2)=LLAMBD(I,2)          007460
03446 1513*      ERETLB(ML,2)=ERETLB(I,2)          007462
03447 1514*      ERETLB(ML,3)=ERETLB(I,3)          007464
03450 1515*      EFT(ML,2)=EFT(I,2)          007466
03451 1516*      GO TO 1420                  007470
03452 1517*      1405 CALL PRTCON          007472
03453 1518*      FTRAN=EFT(I,2)/ELAMBD(I,2)          007475
03454 1519*      PRINT 1410,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),
03454 1520*      1ASTR(I,1),
03454 1521*      1 LLAMBD(I,2),(ERETLB(I,J),J=2,3),FTRAN,EFT(I,2),ASTR(I,2)          007500
03474 1522*      1410 FORMAT('0',T2,F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,5(1PE9.4,2X),
03474 1523*      11PE9.4,A1)          007530
03475 1524*      1420 CONTINUE                  007530
03477 1525*      IF(L.EQ.0) GO TO 1426          007530
03501 1526*      PKCON=1                     007532
03502 1527*      DO 1425 I=MX,ML            007545
03505 1528*      CALL PRTCON                 007545
03506 1529*      FTRAN=EFT(I,2)/ELAMBD(I,2)          007547
03507 1530*      PRINT 1410,EINSTR(I,1),PKCAL(I),EINSTR(I,2),EIFOFX(I,2),
03507 1531*      1ELAMBD(I,2),ASTR(I,2),LLAMBD(I,2),(ERETLB(I,J),J=2,3),FTRAN,
03507 1532*      1EFT(I,2),ASTR(I,2)          007552
03527 1533*      1425 CONTINUE                  007603
03531 1534*      1426 CONTINUE                  007603
03532 1535*      GOTO 1515                   007603
03532 1536*      C                         007603
03532 1537*      C      PRINT TABLE WITH GENERAL WEIGHTING AND ONE FILTER 007603

```

B-32

```

03532 1538* C
03533 1539* 1430 L=0
03534 1540* K=1
03535 1541* DO 1450 I = 1,MAXELM
03540 1542* CFRES = SEQUEN(EINSTR,I,CF,K)
03541 1543* IF(EINSTR(I,1).GT.0) GO TO 1435
03543 1544* L=L+1
03544 1545* ML=MAXELM+L
03545 1546* EINSTR(ML,1)=ABS(EINSTR(I,1))
03546 1547* PKCAL(ML)=CFRES
03547 1548* EINSTR(ML,2)=EINSTR(I,2)
03550 1549* EIFOFX(ML,2)=EIFOFX(I,2)
03551 1550* ELAMBD(ML,2)=ELAMBD(I,2)
03552 1551* LLAMBD(ML,2)=LLAMBD(I,2)
03553 1552* ERETLB(ML,2)=ERETLB(I,2)
03554 1553* ERETLB(ML,3)=ERETLB(I,3)
03555 1554* GLAMBD(ML,2)=GLAMBD(I,2)
03556 1555* EFT(ML,2)=EFT(I,2)
03557 1556* GO TO 1450
03560 1557* 1435 CALL PRTCON
03561 1558* FTRAN=EFT(I,2)/ELAMBD(I,2)
03562 1559* PRINT 1440,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),
03562 1560* 1ASTR(I,1),
03562 1561* 1LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2),FTRAN,EFT(I,2),
03562 1562* 2ASTR(I,2)
03603 1563* 1440 FORMAT('0',T2,F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,5(1PE9.4,2X),
03603 1564* 11PE9.4,A1)
03604 1565* 1450 CONTINUE
03606 1566* IF(L.EQ.0) GO TO 1456
03610 1567* PKCON=1
03611 1568* DO 1455 I=MX,ML
03614 1569* CALL PRTCON
03615 1570* FTRAN=EFT(I,2)/ELAMBD(I,2)
03616 1571* PRINT 1440,EINSTR(I,1),PKCAL(I),EINSTR(I,2),EIFOFX(I,2),
03616 1572* 1ELAMBD(I,2),ASTR(I,1),LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2),
03616 1573* 2FTRAN,EFT(I,2),ASTR(I,2)
03637 1574* 1455 CONTINUE
03641 1575* 1456 CONTINUE
03642 1576* GOTO 1515
03642 1577* C
03642 1578* C PRINT TABLE WITH TWO FILTERS AND NO GENERAL WEIGHTING DATA
03642 1579* C OR THREE FILTERS AND NO GENERAL WEIGHTING DATA
03642 1580* C
03643 1581* 1460 L=0
03644 1582* K=1
03645 1583* DO 1480 I = 1,MAXELM
03650 1584* CFRES = SEQUEN(EINSTR,I,CF,K)
03651 1585* IF(EINSTR(I,1).GT.0) GO TO 1465
03653 1586* L=L+1
03654 1587* ML=MAXELM+L
03655 1588* EINSTR(ML,1)=ABS(EINSTR(I,1))
03656 1589* PKCAL(ML)=CFRES
03657 1590* EINSTR(ML,2)=EINSTR(I,2)
03660 1591* EIFOFX(ML,2)=EIFOFX(I,2)
03661 1592* ELAMBD(ML,2)=ELAMBD(I,2)
03662 1593* LLAMBD(ML,2)=LLAMBD(I,2)
03663 1594* ERETLB(ML,2)=ERETLB(I,2)
03664 1595* ERETLB(ML,3)=ERETLB(I,3)

```

```

03665 1596*      EFT(ML,2)=EFT(I,2)                                010042
03666 1597*      EFT(ML,3)=EFT(I,3)                                010044
03667 1598*      EFT(ML,4)=EFT(I,4)                                010046
03670 1599*      GO TO 1480.                                     010050
03671 1600*      1465 CALL PRTCON                               010052
03672 1601*      PRINT 1470,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),
03672   1ASTR(I,1),
03672   1LLAMBD(I,2),(ERETLB(I,J),J=2,3),((EFT(I,L),ASTR(I,L)),L=2,4) 010053
03672   1470 FORMAT('0',F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,3(1PE9.4,2X),T96,
03714 1604*      13(1PE9.4,A1,1X))                                010053
03714 1605*      1480 CONTINUE                                 010110
03715 1606*      IF(L.EQ.0) GO TO 1486                            010110
03717 1607*      03721 1608*      PKCON=1                                010112
03722 1609*      DO 1485 I=MX,ML                                010127
03725 1610*      CALL PRTCON                               010127
03726 1611*      PRINT 1470,EINSTR(I,1),PKCAL(I),EINSTR(I,2),EIFOFX(I,2),
03726 1612*      1ELAMBD(I,2),ASTR(I,1),LLAMBD(I,2),(ERETLB(I,J),J=2,3),((EFT(I,L),A
03726 1613*      2STR(I,L)),L=2,4)                                010131
03750 1614*      1485 CONTINUE                               010166
03752 1615*      1486 CONTINUE                               010166
03753 1616*      GOTO 1515                                010166
03753 1617*      C                                         010166
03753 1618*      C      PRINT TABLE WITH GENERAL WEIGHTING AND BOTH FILTERS 010166
03753 1619*      C      OR FILTER THREE                         010166
03753 1620*      C                                         010166
03754 1621*      03755 1622*      1490 L=0                                010167
03755 1623*      K=1                                         010167
03756 1624*      DO 1510 I = 1,MAXELM                           010176
03761 1624*      CFRES = SEQUEN(EINSTR,I,CF,K)                010176
03762 1625*      IF(EINSTR(I,1).GT.0) GO TO 1495              010205
03764 1626*      L=L+1                                    010210
03765 1627*      ML=MAXELM+L                                010213
03766 1628*      EINSTR(ML,1)=ABS(EINSTR(I,1))               010216
03767 1629*      PKCAL(ML)=CFRES                            010220
03770 1630*      EINSTR(ML,2)=EINSTR(I,2)                  010221
03771 1631*      EIFOFX(ML,2)=EIFOFX(I,2)                 010223
03772 1632*      ELAMBD(ML,2)=ELAMBD(I,2)                 010225
03773 1633*      LLAMBD(ML,2)=LLAMBD(I,2)                 010227
03774 1634*      ERETLB(ML,2)=ERETLB(I,2)                 010231
03775 1635*      ERETLB(ML,3)=ERETLB(I,3)                 010233
03776 1636*      GLAMBD(ML,2)=GLAMBD(I,2)                010235
03777 1637*      EFT(ML,2)=EFT(I,2)                                010237
04000 1638*      EFT(ML,3)=EFT(I,3)                                010241
04001 1639*      EFT(ML,4)=EFT(I,4)                                010243
04002 1640*      GO TO 1510                                010245
04003 1641*      1495 CALL PRTCON                               010247
04004 1642*      PRINT 1500,EINSTR(I,1),CFRES,EINSTR(I,2),EIFOFX(I,2),ELAMBD(I,2),
04004 1643*      1ASTR(I,1),LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2), 010250
04004 1644*      2((EFT(I,L),ASTR(I,L)),L=2,4)                010250
04027 1645*      1500 FORMAT('0',T2,F5.0,T8,3(1PE9.4,2X),1PE9.4,A1,1X,4(1PE9.4,2X),
04027 1646*      13(1PE9.4,A1,1X))                                010307
04030 1647*      1510 CONTINUE                               010307
04032 1648*      IF(L.EQ.0) GO TO 1516                            010307
04034 1649*      PKCON=1                                    010311
04035 1650*      DO 1514 I=MX,ML                                010326
04040 1651*      CALL PRTCON                               010326
04041 1652*      PRINT 1500,EINSTR(I,1),PKCAL(I),EINSTR(I,2),EIFOFX(I,2),
04041 1653*      1ELAMBD(I,2),ASTR(I,1),LLAMBD(I,2),(ERETLB(I,J),J=2,3),GLAMBD(I,2), 010330

```

04041	1654*	2((EFT(I,L),ASTR(I,L)),L=2,4)	010330
04064	1655*	1514 CONTINUE	010367
04066	1656*	1516 CONTINUE	010367
04067	1657*	1515 PRINT 1520	010367
04071	1658*	1520 FORMAT('1')	010372
04072	1659*	PAGE=PAGE+1	010372
04073	1660*	PRINT 6010,DATE,PAGE	010375
04077	1661*	PRINT 6020,DESCRP	010406
04102	1662*	PRINT 6025, EVENT,OMEGA,FIG	010415
04107	1663*	6025 FORMAT(T2,'SOURCE DESCRIPTION: ', A 3A6,'. SOLID ANGLE = ',1PE9.2,'. FIGURE NO. ',A2,' ON PLOT.')	010427
04107	1664*	IF (ITEST .EQ. 0) GOTO 6130	010427
04110	1665*	GOTO (6131,6132,6133),ITEST	010431
04112	1666*	6130 PRINT 6030	010442
04113	1667*	GOTO 6040	010445
04115	1668*	6131 PRINT 6031	010447
04120	1670*	GOTO 6040	010452
04121	1671*	6132 PRINT 6032	010454
04123	1672*	GOTO 6040	010457
04124	1673*	6133 CONTINUE	010461
04125	1674*	IF(NUMFIL.EQ.2) PRINT 6033	010461
04130	1675*	IF(NUMFIL.EQ.3) PRINT 6034	010467
04133	1676*	6010 FORMAT(T2,'LMD SPECTRAL WEIGHTING PROGRAM',T90,'DATE ',2A6, 1 T110,'PAGE ',13)	010477
04133	1677*	C	010477
04134	1678*	6020 FORMAT('0',T2,13A6,A2/T2,13A6,A2)	010477
04134	1679*	C	010477
04135	1680*	6030 FORMAT(//T45,'SUMMARIZATION SHEET FOR SOURCE', A //,T2,120(''))	010477
04135	1681*	6031 FORMAT(//T37,'SUMMARIZATION SHEET FOR SOURCE A WITH FILTER ONE',/,T2,120(''))	010477
04136	1682*	6032 FORMAT(//T37,'SUMMARIZATION SHEET FOR SOURCE A WITH FILTER TWO',/,T2,120(''))	010477
04136	1683*	6033 FORMAT(//T30,'SUMMARIZATION SHEET FOR SOURCE A WITH FILTERS ONE AND TWO',/,T2,120(''))	010477
04137	1684*	6034 FORMAT(//T30,'SUMMARIZATION SHEET FOR SOURCE A WITH FILTER THREE',/,T2,120(''))	010477
04140	1685*	6040 PRINT 1650, ELAMBD(1,1),ELAMBD(MAXELM,1),EDELLB	010477
04147	1692*	PRINT 1655,LDELLB	010507
04152	1693*	PRINT 1660,ACGIH	010514
04155	1694*	PRINT 1670,CIE	010521
04160	1695*	PRINT 1680,ANSI	010526
04163	1696*	PRINT 1690,BLUHAZ	010533
04166	1697*	PRINT 1700,XBAR	010540
04171	1698*	PRINT 1710,YBAR	010545
04174	1699*	PRINT 1720,ZBAR	010552
04177	1700*	PRINT 1730,P445	010557
04202	1701*	PRINT 1740,P535	010564
04205	1702*	PRINT 1750,P575	010571
04210	1703*	PRINT 1760,VE	010576
04213	1704*	PRINT 1770,VIE	010603
04216	1705*	PRINT 1780,TRANS	010610
04221	1706*	PRINT 1790,TRANTX	010615
04224	1707*	PRINT 1800,EECA	010622
04227	1708*	PRINT 1810,PCTUV	010627
04232	1709*	PRINT 1820,PCTVI	010634
04235	1710*	PRINT 1830,PCTNIR	010641
04240	1711*	1640 CONTINUE	010646

04241	1712*	1645 PRINT 1880,ILLUM	010646
04244	1713*	PRINT 1890,LUMIN	-010653
04247	1714*	PRINT 1895,BLURAD	010660
04252	1715*	IF (NUMFIL .EQ. 0) GOTO 1646	010665
04254	1716*	IF(ITEST.EQ.0)GO TO 1041	010667
04256	1717*	IF(NUMFIL.EQ.1.AND.ITEST.EQ.1)GO TO 1646	010671
04260	1718*	GO TO(1042,1043,1646),ITEST	010705
04261	1719*	1646 CALL INITIL	010716
04262	1720*	GOTO 530	010717
04263	1721*	1650 FORMAT('0 TOTAL SPECTRAL IRRADIANCE FROM ',F6.0,' TO ',F6.0,	010721
04263	1722*	1 ' NM ',T100,1PE10.4)	010721
04264	1723*	1655 FORMAT('0 TOTAL RADIANCE OF SOURCE FROM LAMBDA-MIN TO LAMBDA-MAX'	010721
04264	1724*	1 ,T100,1PE10.4)	010721
04265	1725*	1660 FORMAT('0 EFFECTIVE ULTRAVIOLET IRRADIANCE ACCORDING TO THE ACGIH	010721
04265	1726*	1 STANDARD ACTION SPECTRUM',T100,1PE10.4)	010721
04266	1727*	1670 FORMAT('0 EFFECTIVE ULTRAVIOLET IRRADIANCE ACCORDING TO 1936 CIE U	010721
04266	1728*	1LTRAVIOLET ERYTHEMA ACTION SPECTRUM',T100,1PE10.4)	010721
04267	1729*	1680 FORMAT('0 EFFECTIVE ULTRAVIOLET IRRADIANCE ACCORDING TO ANSI-Z136	010721
04267	1730*	1LASER WEIGHTING UV HAZARD FUNCTION',T100,1PE10.4)	010721
04270	1731*	1690 FORMAT('0 BLUE LIGHT HAZARD FUNCTION WEIGHTED AGAINST SPECTRAL IRR	010721
04270	1732*	1ADIANCE',T100,1PE10.4)	010721
04271	1733*	1700 FORMAT('0 1931 BLUE CHROMATICITY COORDINATES WEIGHTED AGAINST SPEC	010721
04271	1734*	1TRAL IRRADIANCE',T100,1PE10.4)	010721
04272	1735*	1710 FORMAT('0 1931 GREEN CHROMATICITY COORDINATES WEIGHTED AGAINST SPE	010721
04272	1736*	1CTRAL IRRADIANCE',T100,1PE10.4)	010721
04273	1737*	1720 FORMAT('0 1931 RED CHROMATICITY COORDINATES WEIGHTED AGAINST SPECT	010721
04273	1738*	1RAL IRRADIANCE',T100,1PE10.4)	010721
04274	1739*	1730 FORMAT('0 DARTNALL NOMOGRAM ABSORPTION COEFFICIENT FOR BLUE WEIGH	010721
04274	1740*	1TED AGAINST SPECTRAL IRRADIANCE',T100,1PE10.4)	010721
04275	1741*	1740 FORMAT('0 DARTNALL NOMOGRAM ABSORPTION COEFFICIENT FOR GREEN WEIGH	010721
04275	1742*	1TED AGAINST SPECTRAL IRRADIANCE',T100,1PE10.4)	010721
04276	1743*	1750 FORMAT('0 DARTNALL NOMOGRAM ABSORPTION COEFFICIENT FOR RED WEIGH	010721
04276	1744*	1TED AGAINST SPECTRAL IRRADIANCE',T100,1PE10.4)	010721
04277	1745*	1760 FORMAT('0 RADIANT EFFICACY (LUMENS/WATT) OF RADIATION FROM LAMBD	010721
04277	1746*	1MIN TO LAMBDA-MAX',T100,1PE10.4)	010721
04300	1747*	1770 FORMAT('0 FRACTION CIE SCOTOPIC RADIATION FROM LAMBDA-MIN TO LAMBD	010721
04300	1748*	1A-MAX ',T100,1PE10.4)	010721
04301	1749*	1780 FORMAT('0 EFFECTIVE TRANSMISSION OF OCULAR MEDIA FROM LAMBDA-MIN T	010721
04301	1750*	10 LAMBDA-MAX',T100,1PE10.4)	010721
04302	1751*	1790 FORMAT('0 EFFECTIVE TRANSMISSION OF OCULAR MEDIA MULTIPLIED BY SPE	010721
04302	1752*	1CTRAL ABSORPTION OF OCULAR MEDIA',T100,1PE10.4)	010721
04303	1753*	1800 FORMAT('0 ANSI LASER MPE WEIGHTING FACTOR FOR VISIBLE AND INFRARED	010721
04303	1754*	1-A',T100,1PE10.4)	010721
04304	1755*	1810 FORMAT('0 PERCENT OF TOTAL IRRADIANCE BETWEEN LAMBDA-MIN AND LAMBD	010721
04304	1756*	1A-MAX WHICH IS ULTRAVIOLET RADIATION',T100,1PE10.4)	010721
04305	1757*	1820 FORMAT('0 PERCENT OF TOTAL IRRADIANCE BETWEEN LAMBDA-MIN AND LAMBD	010721
04305	1758*	1A-MAX WHICH IS VISIBLE RADIATION',T100,1PE10.4)	010721
04306	1759*	1830 FORMAT('0 PERCENT OF TOTAL IRRADIANCE BETWEEN LAMBDA-MIN AND LAMBD	010721
04306	1760*	1A-MAX WHICH IS NEAR INFRARED RADIATION',T100,1PE10.4)	010721
04307	1761*	1880 FORMAT('0 ILLUMINANCE IN LUMENS PER SQUARE CENTIMETER',T100,1PE10.	010721
04307	1762*	14)	010721
04310	1763*	1890 FORMAT('0 LUMINANCE IN CANDELAS PER SQUARE CENTIMETER',T100,1PE10.	010721
04310	1764*	14)	010721
04311	1765*	1895 FORMAT('0 BLUE LIGHT RADIANCE IN EFFECTIVE BLUE WATTS PER SQUARE C	010721
04311	1766*	1ENTIMETER',T100,1PE10.4)	010721
04312	1767*	9999 END FILE 15	010721
04313	1768*	REWIND 15	-010723
04314	1769*	CALL HPLOT	010726

04315	1770*	PRINT 1900	010730
04317	1771*	1900 FORMAT('1',' ALL PROCESSING COMPLETED')	010734
04320	1772*	STOP	010734
04320	1773*	C	010734
04320	1774*	C *****	010734
04320	1775*	C *	010734
04320	1776*	C * END OF MAIN PROGRAM *	010734
04320	1777*	C *	010734
04320	1778*	C * SUBROUTINES FOLLOW *	010734
04320	1779*	C *	010734
04320	1780*	C *****	010734
04320	1781*	C	010734
04320	1782*	C *****	010734
04320	1783*	C *	010734
04320	1784*	C * SUBROUTINE IDENT *	010734
04320	1785*	C *	010734
04320	1786*	C *****	010734
04320	1787*	C	010734
04320	1788*	C	010734
04320	1789*	C PRINT OUT THE INPUT PARAMETERS CONVERTING TO	010734
04320	1790*	C NARRATIVE WHEN POSSIBLE	010734
04320	1791*	C	010734
04320	1792*	C	010734
04320	1793*	C	010734
04321	1794*	SUBROUTINE IDENT	010740
04324	1795*	DIMENSION CALTAB(2,3),GFTAB(23,4)	010740
04325	1796*	INTEGER DSTORE(7,2)	010740
04326	1797*	INTEGER CALTAB	010740
04327	1798*	INTEGER GFTAB	010740
04330	1799*	DATA ((CALTAB(IC,JC),JC=1,3),IC=1,2) /	010740
04330	1800*	1'RAW DA', 'TA',	010740
04330	1801*	2'CALCUL', 'ATED D', 'ATA',	010740
04332	1802*	DATA ((GFTAB(IG,JG),JG=1,4),IG=1,16)/	010740
04332	1803*	1'NONE',	010740
04332	1804*	2'ELAMBD', 'A*S-LA', 'MBDA',	010740
04332	1805*	3'ELAMBD', 'A*U-LA', 'MBDA',	010740
04332	1806*	4'ELAMBD', 'A*A-LA', 'MBDA',	010740
04332	1807*	5'ELAMBD', 'A*T-LA', 'MBDA',	010740
04332	1808*	6'ELAMBD', 'A*TA-L', 'AMBDA',	010740
04332	1809*	7'ELAMBD', 'A*CA-L', 'AMBDA',	010740
04332	1810*	8'ELAMBD', 'A*U-LA', 'MBDA',	010740
04332	1811*	9'ELAMBD', 'A*VP-L', 'AMBDA',	010740
04332	1812*	A'ELAMBD', 'A*B-LA', 'MBDA',	010740
04332	1813*	B'ELAMBD', 'A*XBAR', '-LAMBD', 'A',	010740
04332	1814*	C'ELAMBD', 'A*YBAR', '-LAMBD', 'A',	010740
04332	1815*	D'ELAMBD', 'A*ZBAR', '-LAMBD', 'A',	010740
04332	1816*	E'ELAMBD', 'A*P445', '-LAMBD', 'A',	010740
04332	1817*	F'ELAMBD', 'A*P535', '-LAMBD', 'A',	010740
04332	1818*	G'ELAMB', 'A*575', '-LAMBD', 'A', /	010740
04334	1819*	DATA ((GFTAB(IG,JG),JG=1,4),IG=17,23)/	010740
04334	1820*	H'FILTER', 'ONE T', 'RANSMI', 'SSION',	010740
04334	1821*	I'FILTER', 'TWO T', 'RANSMI', 'SSION',	010740
04334	1822*	J'TRANS', 'OF BOT', 'H FILT', 'ERS',	010740
04334	1823*	K'FILTER', '3 TRA', 'NSMISS', 'ION',	010740
04334	1824*	L'RADIAN', 'CE',	010740
04334	1825*	M'BLUE L', 'IGHT R', 'ADIANC', 'E',	010740
04334	1826*	N'CALIBR', 'ATION', 'CURVE', //	010740
04336	1827*	DATA ((DSTORE(IG,JG),JG=1,2),IG=1,7)/	010740

04336	1828*	1'NONE',	010740
04336	1829*	2'FILTER', 'ONE',	010740
04336	1830*	3'FILTER', 'TWO',	010740
04336	1831*	4'FILTER', 'THREE',	010740
04336	1832*	5'SOURCE',	010740
04336	1833*	6'CALIBR', 'ATION',	010740
04336	1834*	7'STAND.', 'LAMP',	010740
04340	1835*	6000 FORMAT(1H1,T5,' DESCRIPTION : ',13A6,A2//,T20,13A6,A2./)	010740
04341	1836*	6010 FORMAT(T20,'NOCOF1 = ',I2,' CALCULATED	010740
04341	1837*	ADATA USED FOR FILTER ONE'))	010740
04342	1838*	6011 FORMAT(T20,'NOCOF1 = ',I2,' RAW DATA USED FOR FILTER ONE'))	010740
04343	1839*	6012 FORMAT(T20,'NOCOF2 = ',I2,' CALCULATED	010740
04343	1840*	A DATA USED FOR FILTER TWO'))	010740
04344	1841*	6013 FORMAT(T20,'NOCOF2 = ',I2,' RAW DATA USED FOR FILTER TWO'))	010740
04345	1842*	6014 FORMAT(T20,'NOCOF3 = ',I2,' CALCULATED	010740
04345	1843*	A DATA USED FOR FILTER THREE'))	010740
04346	1844*	6015 FORMAT(T20,'NOCOF3 = ',I2,' RAW DATA USED FOR FILTER THREE') ,/)	010740
04347	1845*	6001 FORMAT(T20,'NUMBER OF FILTERS USED = ',I2,/)	010740
04350	1846*	6020 FORMAT(T20,'CALDAT = ',I2,' CALIBRATION INPUT IS RAW DATA'))	010740
04351	1847*	6021 FORMAT(T20,'CALDAT = ',I2,' CALIBRATION INPUT IS CALCULATED DATA	010740
04351	1848*	A'))	010740
04352	1849*	6022 FORMAT(T20,'CALDAT = ',I2,' NO CALIBRATION INPUT, TABLE SET TO ',	010740
04352	1850*	A 'ONES'))	010740
04353	1851*	6024 FORMAT(T20,'CALDAT = ',I2,' CALIBRATION IS RAW WITH OVERLAP ',	010740
04353	1852*	1'REGION BETWEEN 250 AND 400 NM')	010740
04354	1853*	6025 FORMAT(T20,'UV STANDARD LAMP: ',13A6,A2)	010740
04355	1854*	6026 FORMAT(T20,'VISIBLE STANDARD LAMP: ',13A6,A2)	010740
04356	1855*	6027 FORMAT(T20,'CALDAT = ',I2,' CALIBRATION IS PRECOMPUTED WITH ',	010740
04356	1856*	1'OVERLAP REGION BETWEEN 250 AND 400 NM')	010740
04357	1857*	6028 FORMAT(T20,'STANDARD LAMP: ',13A6,A2)	010740
04360	1858*	6030 FORMAT('0',T20,'GENFUN = ',I2,' NO GENERAL FUNCTION'))	010740
04361	1859*	6031 FORMAT('0',T20,'GENFUN = ',I2,' GENERAL FUNCTION IS LISTED BELOW: '	010740
04361	1860*	1)	010740
04362	1861*	6035 FORMAT(T20,'UV CALIBRATION: ',13A6,A2)	010740
04363	1862*	6036 FORMAT(T20,'VISIBLE CALIBRATION: ',13A6,A2)	010740
04364	1863*	6037 FORMAT(T20,'IR CALIBRATION: ',13A6,A2)	010740
04365	1864*	6040 FORMAT(T20,7A6)	010740
04366	1865*	6050 FORMAT('0',T20,'GENERAL WEIGHTING FUNCTION= ',4A6,' (NOT PLOTTED)')	010740
04366	1866*	1)	010740
04367	1867*	6051 FORMAT('0',T20,'GENERAL WEIGHTING FUNCTION= ',4A6,' (PLOTTED)')	010740
04370	1868*	6060 FORMAT(T20,'ULTRAVIOLET DISTANCE FACTOR = ',F9.2//,	010740
04370	1869*	A T20,'VISIBLE DISTANCE FACTOR = ',F9.2)	010740
04371	1870*	6080 FORMAT(T20,'FILTER 1 : ',13A6,A2)	010740
04372	1871*	6090 FORMAT(T20,'FILTER 2 : ',13A6,A2)	010740
04373	1872*	6095 FORMAT(T20,'FILTER 3 : ',13A6,A2)	010740
04374	1873*	7000 FORMAT('0',T20,'SOURCE INTERPOLATED TO 5NM INTERVALS',/)	010740
04375	1874*	7010 FORMAT('0',T20,'SOURCE NOT INTERPOLATED',/)	010740
04376	1875*	7020 FORMAT('0',T20,'DECK STORED: ',2A6,/)	010740
04377	1876*	7030 FORMAT('0',T20,'A STAR(*) AFTER EITHER THE SOURCE DATA OR FILTER',	010740
04377	1877*	A /,T20,'TRANSMISSION INDICATES THAT THESE DATA HAVE BEEN INTERPOLATED')	010740
04377	1878*		010740
04400	1879*	7040 FORMAT('0',T20,'BANDPASS VALUES: 200. -- ',F5.0,' NM ---- ',	010740
04400	1880*	1 F5.0,' NM.',/,T39,F5.0,' -- ',F5.0,' NM --- ',F5.0,' NM.',/)	010740
04400	1881*	2 T39,F5.0,' --- 1400. NM ---- ',F5.0,' NM.')	010740
04401	1882*	7050 FORMAT('0',T20,'SPECTRAL IRRADIANCE NOT PLOTTED.'))	010740
04402	1883*	7060 FORMAT('0',T20,'PLOTS: BOTH LINEAR AND LOG.'))	010740
04403	1884*	7070 FORMAT('0',T20,'PLOTS: LINEAR ONLY.'))	010740
04404	1885*	7080 FORMAT('0',T20,'PLOTS: LOG ONLY.'))	010740

04405	1886*	7090 FORMAT('0',T20,'DATA TABLES NOT PRINTED.')	010740
04406	1887*	8000 FORMAT(T20,'AND OVERLAP REGION BETWEEN 700 AND 800 NM')	010740
04407	1888*	8010 FORMAT(T20,'IR CALIBRATION LAMP: ',13A6,A2)	010740
04407	1889*	C	010740
04407	1890*	C	010740
04407	1891*	C	010740
04407	1892*	C PRINT DESCRIPTION	010740
04410	1893*	PRINT 6000,(DESCRP(I),I=1,28)	010740
04410	1894*	C PRINT NUMBER OF FILTERS USED	010740
04413	1895*	PRINT 6001,NUMFIL	010747
04413	1896*	C PRINT CALCULATED/RAW FILTER DATA	010747
04416	1897*	IF(NUMFIL.EQ.0) GO TO 25	010754
04420	1898*	IF (NOCOF1 .EQ. 1) GO TO 10	010756
04422	1899*	PRINT 6011,NOCOF1	010761
04425	1900*	PRINT 6080,FILHDR	010766
04430	1901*	GO TO 20	010775
04431	1902*	10 CONTINUE	010777
04432	1903*	PRINT 6010,NOCOF1	010777
04435	1904*	PRINT 6080,FILHDR	011003
04440	1905*	20 IF (NUMFIL .EQ. 1) GOTO 25	011013
04442	1906*	IF (NDCOF2 .EQ. 1) GOTO 11	011015
04444	1907*	PRINT 6013,NOCOF2	011020
04447	1908*	PRINT 6090,FILHD2	011025
04452	1909*	GO TO 13	011034
04453	1910*	11 PRINT 6012,NOCOF2	011036
04456	1911*	PRINT 6090,FILHD2	011042
04461	1912*	13 CONTINUE	011052
04462	1913*	IF(NUMFIL.EQ.2) GO TO 25	011052
04464	1914*	IF(NDCOF3.EQ.1) GO TO 12	011054
04466	1915*	PRINT 6015,NOCOF3	011057
04471	1916*	PRINT 6095,FILHD3	011064
04474	1917*	GO TO 25	011073
04475	1918*	12 PRINT 6014,NOCOF3	011075
04500	1919*	PRINT 6095,FILHD3	011101
04500	1920*	C PRINT DATA TYPE	011101
04503	1921*	25 ICAL = CALDAT + 1	011111
04504	1922*	GO TO (30,31,33,34,35,34,35), ICAL	011113
04505	1923*	31 CONTINUE	011130
04506	1924*	PRINT 6021,CALDAT	011130
04511	1925*	PRINT 6023,CALHDR	011134
04514	1926*	PRINT 6028,LAMPHD	011143
04517	1927*	6023 FORMAT(T20,'CALIBRATION : ',13A6,A2)	011152
04520	1928*	GO TO 40	011152
04521	1929*	30 CONTINUE	011154
04522	1930*	PRINT 6020,CALDAT	011154
04525	1931*	PRINT 6023,CALHDR	011160
04530	1932*	PRINT 6028,LAMPHD	011167
04533	1933*	GO TO 40	011176
04534	1934*	33 CONTINUE	011200
04535	1935*	PRINT 6022,CALDAT	011200
04540	1936*	GO TO 40	011204
04541	1937*	34 PRINT 6024,CALDAT	011206
04544	1938*	IF(CALDAT.EQ.5) PRINT 8000	011212
04547	1939*	PRINT 6035,CALUV	011221
04552	1940*	PRINT 6025,LAMPUV	011230
04555	1941*	PRINT 6036,CALHDR	011237
04560	1942*	PRINT 6026,LAMPHD	011246
04563	1943*	IF (CALDAT.NE.5) GO TO 40	011255

B-39

04565	1944*	PRINT 6037, CALIR	011260
04570	1945*	PRINT 8010, LAMPIR	011267
04573	1946*	GO TO 40	011276
04574	1947*	35 PRINT 6027,CALDAT	011300
04577	1948*	IF(CALDAT.EQ.6) PRINT 8000	011304
04602	1949*	PRINT 6035,CALUV	011313
04605	1950*	PRINT 6036,CALHDR	011322
04610	1951*	IF (CALDAT.NE.6) GO TO 40	011331
04612	1952*	PRINT 6037, CALIR	011334
04615	1953*	40 CONTINUE	011344
04615	1954*	C PRINT GENERAL WEIGHTING TABLE	011344
04616	1955*	IX=GENWEI+1	011344
04617	1956*	IF(NUMFIL.EQ.3.AND.GENWEI.EQ.18) IX=20	011346
04621	1957*	IF(FLPLOT.EQ.0) PRINT 6050,(GFTAB(IX,IY),IY=1,4)	011364
04630	1958*	IF(FLPLOT.NE.0) PRINT 6051,(GFTAB(IX,IY),IY=1,4)	011403
04630	1959*	C PRINT IOS SOURCE INTERPOLATION	011403
04637	1960*	IF(IOS.EQ.1) PRINT 7000	011417
04642	1961*	IF(IOS.NE.1) PRINT 7010	011426
04645	1962*	PRINT 7030	011435
04647	1963*	PRINT 7040, BWA1,BANPAS(1),BWA1,BWA2,BANPAS(2),BWA2,BANPAS(3)	011441
04660	1964*	IF(SUPRES.GT.0) PRINT 7050	011454
04663	1965*	IF(LINLOG.EQ.0) PRINT 7060	011463
04666	1966*	IF(LINLOG.EQ.1) PRINT 7070	011471
04671	1967*	IF(LINLOG.EQ.2) PRINT 7080	011500
04674	1968*	IF(SUMRY.EQ.1) PRINT 7090	011507
04674	1969*	C	011507
04674	1970*	C PRINT DECK STORED	011507
04677	1971*	IX=STORE + 1	011516
04700	1972*	PRINT 7020, DSTORE(IX,1),DSTORE(IX,2)	011521
04700	1973*	C	011521
04700	1974*	C PRINT DFU AND DFV	011521
04700	1975*	C	011521
04704	1976*	PRINT 6060,DFU,DFV	011531
04704	1977*	C	011531
04704	1978*	C PRINT GENERAL FUNCTION	011531
04710	1979*	IF(GENFUN.EQ.0) GO TO 50	011537
04712	1980*	PRINT 6031,GENFUN	011541
04715	1981*	GO TO 60	011546
04716	1982*	50 CONTINUE	011550
04717	1983*	PRINT 6030,GENFUN	011550
04722	1984*	60 CONTINUE	011555
04722	1985*	C	011555
04723	1986*	RETURN	011555
04723	1987*	C	011555
04723	1988*	C *****	011555
04723	1989*	C *	011555
04723	1990*	C * SUBROUTINE INITIL *	011555
04723	1991*	C *	011555
04723	1992*	C *****	011555
04723	1993*	C	011555
04724	1994*	SUBROUTINE INITIL	011575
04724	1995*	C	011575
04724	1996*	C THIS SUBROUTINE INITIALIZES MAIN PROGRAM VARIABLES	011575
04724	1997*	C	011575
04727	1998*	DO 20 I = 1,2	011575
04732	1999*	DO 10 J = 1,340	011575
04735	2000*	EINSTR(J,I) = 0	011575
04736	2001*	EIFOFX(J,I) = 0	011575

04737 2002* ELAMBD(J,I) = 0 011576
 04740 2003* LLAMBD(J,I) = 0 011577
 04741 2004* ERETLB(J,I) = 0 011600
 04742 2005* GLAMBD(J,I) = 0 011601
 04743 2006* TEMP(J,I)=0. 011602
 04744 2007* DO 5 K=1,3 011605
 04747 2008* 5 CUV(J,I,K) = 0 011605
 04751 2009* 10 CONTINUE 011616
 04753 2010* 20 CONTINUE 011616
 04755 2011* DO 40 I = 1,4 011616
 04760 2012* DO 30 J = 1,340 011616
 04763 2013* EFT(J,I) = 0 011616
 04764 2014* ASTR(J,I)=' ' 011616
 04765 2015* 30 CONTINUE 011624
 04767 2016* 40 CONTINUE 011624
 04771 2017* DO 50 I = 1,340 011624
 04774 2018* ERETLB(I,3) = 0 011624
 04775 2019* DELTA(I) = 0 011624
 04776 2020* 50 CONTINUE 011631
 05000 2021* DO 60 I = 1,9 011631
 05003 2022* FILTER(I) = 0 011631
 05004 2023* 60 CONTINUE 011635
 05006 2024* DO 70 I=1,28 011635
 05011 2025* 70 DESCRP(I)=' ' 011635
 05013 2026* RETURN 011637
 05013 2027* C *****
 05013 2028* C * * * * *
 05013 2029* C * * * * *
 05013 2030* C * SUBROUTINE INTERP * 011637
 05013 2031* C * * * * *
 05013 2032* C * * * * *
 05013 2033* C *****
 05014 2034* SUBROUTINE INTERP(X,Y,I,J,Z) 011662
 05014 2035* C 011662
 05014 2036* C THIS SUBROUTINE INTEPOLES THE DATA IN ARRAY Y TO CORRESPOND TO ARRAY 011662
 05014 2037* C X AND PUTS THE RESULT IN Z 011662
 05014 2038* C 011662
 05017 2039* REAL X(340,2) 011662
 05020 2040* REAL Y(340,2) 011662
 05021 2041* IF(J.EQ.1) GO TO 50 011662
 05021 2042* C 011662
 05023 2043* IF(J.EQ.2.AND.Y(1,1).LT.0) GO TO 50 011666
 05025 2044* A=Y(J,1)-Y(J-1,1) 011702
 05026 2045* IF(Y(J,1).LT.0) A=Y(J+1,1)-Y(J-1,1) 011710
 05030 2046* IF(Y(J-1,1).LT.0) A=Y(J,1)-Y(J-2,1) 011724
 05030 2047* C 011724
 05030 2048* C 011724
 05032 2049* IF(Y(J,1).GT.0.AND.Y(J-1,1).GT.0) GO TO 10 -011733
 05034 2050* IF(Y(J,1).LT.0) GO TO 20 011750
 05036 2051* IF(Y(J-1,1).LT.0) GO TO 30 -011753
 05036 2052* C 011753
 05040 2053* 10 B=Y(J,2)/Y(J-1,2) 011757
 05041 2054* IF(B.EQ.0) GO TO 50 -011763
 05043 2055* IF(B.GE.0) GO TO 15 011770
 05045 2056* WRITE(6,100) Y(J,1),Y(J,2),Y(J-1,1),Y(J-1,2) 011772
 05053 2057* 100 FORMAT(' ERROR IN INTERP ROUTINE NEAR:',/,1X,4G20.10) -012003
 05054 2058* GO TO 50 -012003
 05055 2059* 15 B=ALOG(B) 012005

05056	2060*	GO TO 40	012010
05056	2061*	C	012010
05057	2062*	20 B=Y(J+1,2)/Y(J-1,2)	012012
05060	2063*	IF(B.EQ.0) GO TO 50	012016
05062	2064*	IF(B.GE.0) GO TO 15	012020
05064	2065*	WRITE(6,100) Y(J-1,1),Y(J-1,2),Y(J+1,1),Y(J+1,2)	012025
05072	2066*	GO TO 50	012036
05072	2067*	C	012036
05073	2068*	30 IF(J.LE.2) GO TO 50	012040
05075	2069*	B=Y(J,2)/Y(J-2,2)	012043
05076	2070*	IF(B.EQ.0) GO TO 50	012050
05100	2071*	IF(B.GE.0) GO TO 15	012055
05102	2072*	WRITE(6,100) Y(J-2,1),Y(J-2,2),Y(J,1),Y(J,2)	012057
05110	2073*	GO TO 50	012070
05111	2074*	40 CONTINUE	012072
05111	2075*	C	012072
05112	2076*	C = B / A	012072
05112	2077*	C	012072
05113	2078*	IF(Y(J-1,1).GT.0) D=ABS(X(I,1))-Y(J-1,1)	012074
05115	2079*	IF(Y(J-1,1).LT.0) D=ABS(X(I,1))-Y(J-2,1)	012114
05115	2080*	C	012114
05117	2081*	E = D * C	012124
05117	2082*	C	012124
05117	2083*	C	012124
05120	2084*	IF(Y(J-1,1).GT.0) GO TO 70	012127
05122	2085*	IF(Y(J-1,1).LE.0) GO TO 80	012133
05122	2086*	C	012133
05124	2087*	70 Z=Y(J-1,2)	012137
05125	2088*	71 IF(Z.GT.0) GO TO 75	012143
05127	2089*	WRITE(6,100) Y(J-1,1),Y(J-1,2)	012145
05133	2090*	GO TO 50	012163
05134	2091*	75 Z=ALOG(Z) + E	012165
05135	2092*	IF(Z.LT.170.DR.Z.GT.-170) GO TO 77	012171
05137	2093*	WRITE(6,100) Y(J-1,1),Y(J-1,2),Z,E	012206
05145	2094*	GO TO 50	012226
05146	2095*	77 Z=EXP(Z)	012230
05147	2096*	GO TO 60	012233
05147	2097*	C	012233
05150	2098*	80 Z=Y(J-2,2)	012235
05151	2099*	GO TO 71	012240
05151	2100*	C	012240
05151	2101*	C	012240
05152	2102*	50 Z=0	012242
05153	2103*	60 RETURN	012243
05153	2104*	C	012243
05153	2105*	C *****	012243
05153	2106*	C * *	012243
05153	2107*	C * FUNCTION SUM *	012243
05153	2108*	C * *	012243
05153	2109*	C *****	012243
05153	2110*	C	012243
05154	2111*	REAL FUNCTION SUM(E,X,D,B)	012302
05154	2112*	C	012302
05154	2113*	THIS FUNCTION SUMS THE PRODUCTS OF EACH ELEMENT OF E,X,D ARRAYS	012302
05154	2114*	* FUNCTION	012302
05154	2115*	C	012302
05157	2116*	DIMENSION E(340,2),	012302
05157	2117*	X(340,2),	012302

```

05157 2118*      2          D(340),
05157 2119*      3          B(340)
05157 2120*      C          B = BAND WIDTH
05160 2121*      K = 1
05161 2122*      SUM = 0
05162 2123*      DO 50 I = 1,MAXELM
05165 2124*      IF(E(I,1) .LT. 0) GOTO 50
05167 2125*      IF(E(I,1) .LT. X(1,1)) GOTO 50
05171 2126*      10 IF(E(I,1) .EQ. X(K,1)) GOTO 30
05173 2127*      IF(X(K,1).EQ.1405) GO TO 55
05175 2128*      IF(E(I,1) .LT. X(K,1)) GOTO 20
05177 2129*      K = K + 1
05200 2130*      GOTO 10
05201 2131*      20 CALL INTERP(E,X,I,K,R)
05202 2132*      GOTO 40
05203 2133*      30 R = X(K,2)
05204 2134*      40 SUM = SUM + E(I,2) * R * D(I)
05205 2135*      50 CONTINUE
05207 2136*      55 K=1
05210 2137*      DO 80 I=1,MAXELM
05213 2138*      IF(E(I,1).GE.0) GO TO 80
05215 2139*      DO 60 J=K,340
05220 2140*      IF(ABS(E(I,1)).LT.X(1,1)) GO TO 80
05222 2141*      IF(ABS(E(I,1)).LE.X(J,1)) GO TO 70
05224 2142*      60 CONTINUE
05226 2143*      70 K=J
05227 2144*      R=X(K,2)
05230 2145*      IF(X(I,1).EQ.1405) RETURN
05232 2146*      IF(ABS(E(I,1)).NE.X(K,1)) CALL INTERP(E,X,I,K,R)
05234 2147*      SUM=SUM+R*B(I)*E(I,2)
05235 2148*      80 CONTINUE
05237 2149*      RETURN
05237 2150*      C
05237 2151*      C          *****
05237 2152*      C          *
05237 2153*      C          *      FUNCTION SUM1      *
05237 2154*      C          *
05237 2155*      C          *****
05237 2156*      C
05240 2157*      REAL FUNCTION SUM1(E,D,L,H,B)
05240 2158*      C
05240 2159*      C          THIS FUNCTION SUMS THE PRODUCTS OF EACH ELEMENT OF E,D ARRAYS
05240 2160*      C          WITH NO FUNCTION
05240 2161*      C
05243 2162*      DIMENSION E(340,2),
05243 2163*              1          D(340),
05243 2164*              2          B(340)
05244 2165*      INTEGER L,H
05245 2166*      SUM1 = 0
05246 2167*      DO 10 I = L,H
05251 2168*      IF(E(I,1) .LT.0) GOTO 10
05253 2169*      SUM1 = SUM1 + E(I,2) * D(I)
05254 2170*      10 CONTINUE
05256 2171*      IF(E(L,1).GT.0)GO TO 11
05260 2172*      SUM1 = SUM1 + E(L,2)*B(L)
05261 2173*      L = L + 1
05262 2174*      11 DO 20 I = L, H
05265 2175*      IF(E(I,1) .GT. 0) GOTO 20

```

B-43

```

05267 2176*      SUM1 = SUM1 + E(I,2)*B(I)          012712
05270 2177*      20 CONTINUE                      012722
05272 2178*      RETURN                         012722
05272 2179*      C
05272 2180*      C **** * * * * * * * * * * * * * * * * * * * * *
05272 2181*      C * * * * * * * * * * * * * * * * * * * * * * *
05272 2182*      C * * * * * * * * * * * * * * * * * * * * * * *
05272 2183*      C * * * * * * * * * * * * * * * * * * * * * * *
05272 2184*      C * * * * * * * * * * * * * * * * * * * * * * *
05272 2185*      C
05273 2186*      SUBROUTINE GLAMCO(R,X,Y,$)        013002
05273 2187*      C
05273 2188*      C SUBROUTINE MULTIPLIES EACH ELEMENT IN X WITH ITS CORRESPONDING 013002
05273 2189*      C ELEMENT IN Y PUTTING IT IN ARRAY R           013002
05273 2190*      C
05276 2191*      DIMENSION R(340,2),                  013002
05276 2192*      1          X(340,2),                  013002
05276 2193*      1          Y(340,2)                   013002
05277 2194*      K = 1
05300 2195*      DO 50 I = 1,MAXELM                 013004
05303 2196*      10 IF(ABS(X(I,1)) .EQ.Y(K,1)) GOTO 30   013034
05305 2197*      IF(ABS(X(I,1)) .LT.Y(K,1)) GOTO 20   013040
05307 2198*      K = K + 1
05310 2199*      GOTO 10
05311 2200*      20 IF(K.GT.1) GO TO 25             013047
05313 2201*      24 Z=0
05314 2202*      GO TO 40
05315 2203*      25 IF(Y(K+1,1).EQ.1405) GO TO 24       013057
05317 2204*      CALL INTERP(X,Y,I,K,Z)            013063
05320 2205*      GOTO 40
05321 2206*      30 Z = Y(K,2)                   013074
05322 2207*      40 R(I,1) = ABS(X(I,1))            013100
05323 2208*      R(I,2) = X(I,2) + Z               013101
05324 2209*      50 CONTINUE
05326 2210*      J=4
05327 2211*      RETURN J
05327 2212*      C **** * * * * * * * * * * * * * * * * * * * * *
05327 2213*      C * * * * * * * * * * * * * * * * * * * * * * *
05327 2214*      C * * * * * * * * * * * * * * * * * * * * * * *
05327 2215*      C * * * * * * * * * * * * * * * * * * * * * * *
05327 2216*      C * * * * * * * * * * * * * * * * * * * * * * *
05327 2217*      C **** * * * * * * * * * * * * * * * * * * * * *
05327 2218*      C
05330 2219*      SUBROUTINE ADJUST(X)              013166
05330 2220*      C
05330 2221*      C THIS SUBROUTINE REALIGNS THE ORIGINAL DATA WITH VALUES OF 013166
05330 2222*      C ELAMBD WHICH HAVE BEEN SOURCE INTERPOLED          013166
05330 2223*      C
05333 2224*      DIMENSION X(340,2)                013166
05334 2225*      DO 10 I=1,MAXELM                 013166
05337 2226*      TEMP(I,1)=0.                     013173
05340 2227*      10 TEMP(I,2)=0.                     013173
05342 2228*      J=1
05343 2229*      I=0
05344 2230*      20 I=I+1
05345 2231*      IF(I.GT.MAXELM) GO TO 40          013203
05347 2232*      IF(ABS(X(J,1)).EQ.ABS(ELAMBD(I,1))) GO TO 30 013206
05351 2233*      TEMP(I,1)=ELAMBD(I,1)            013216

```

05352	2234*	GO TO 20	013220
05353	2235*	30 CONTINUE	013222
05354	2236*	TEMP(I,1)=X(J,1)	013222
05355	2237*	TEMP(I,2)=X(J,2)	013227
05356	2238*	J=J+1	013233
05357	2239*	GO TO 20	013236
05360	2240*	40 DO 50 I=1,MAXELM	013240
05363	2241*	X(I,1)=TEMP(I,1)	013254
05364	2242*	X(I,2)=TEMP(I,2)	013255
05365	2243*	50 CONTINUE	013260
05367	2244*	RETURN	013260
05367	2245*	C	013260
05367	2246*	C *****	013260
05367	2247*	C *	013260
05367	2248*	C * SUBROUTINE DELSUB *	013260
05367	2249*	C *	013260
05367	2250*	C *****	013260
05367	2251*	C	013260
05370	2252*	SUBROUTINE DELSUB(X,D,B)	013303
05370	2253*	C	013303
05370	2254*	C THIS SUBROUTINE ASSIGNS A VALUE OF DELTA OR BW TO EACH	013303
05370	2255*	C VALUE OF ELAMBD AFTER THE SOURCE HAS BEEN INTERPOLED	013303
05370	2256*	C	013303
05373	2257*	DIMENSION X(340,2),D(340),B(340)	013303
05374	2258*	DO 100 I=1,MAXELM	013303
05377	2259*	IF(X(I,1).LT.0) GO TO 20	013324
05401	2260*	IF(I.EQ.1) GO TO 30	013327
05403	2261*	D(I)=X(I,1)-X(I-1,1)	013332
05404	2262*	IF(X(I-1,1).LT.0) D(I)=X(I,1)-X(I-2,1)	013335
05406	2263*	GO TO 100	013343
05407	2264*	20 B(I)=BANPAS(1)	013345
05410	2265*	IF(ABS(X(I,1)).GT.BWAV1) B(I)=BANPAS(2)	013346
05412	2266*	IF(ABS(X(I,1)).GT.BWAV2) B(I)=BANPAS(3)	013354
05414	2267*	GO TO 100	013362
05415	2268*	30 D(I)=(X(I+1,1)-X(I,1))/2.0	013364
05416	2269*	IF(X(I+1,1).LT.0) D(I)=(X(I+2,1)-X(I,1))/2.0	013367
05420	2270*	100 CONTINUE	013404
05422	2271*	50 CONTINUE	013404
05423	2272*	RETURN	013404
05423	2273*	C *****	013404
05423	2274*	C *	013404
05423	2275*	C * SUBROUTINE FSUB *	013404
05423	2276*	C *	013404
05423	2277*	C *****	013404
05423	2278*	C	013404
05423	2279*	C	013404
05424	2280*	SUBROUTINE FSUB(R,X,Y,L,\$)	013443
05424	2281*	C	013443
05424	2282*	C SUBROUTINE DIVIDES EACH ELEMENT OF EFT TO DETERMINE FILTER	013443
05424	2283*	C TRANSMISSION FOR PRINTOUT IN SPACE PROVIDED FOR GENERAL	013443
05424	2284*	C WEIGHTING TABLE	013443
05424	2285*	C	013443
05427	2286*	DIMENSION R(340,2),X(340,2),Y(340,4)	013443
05430	2287*	K=1	013443
05431	2288*	DO 50 I=1,MAXELM	013445
05434	2289*	R(I,1)=ABS(X(I,1))	013500
05435	2290*	R(I,2)=Y(I,L)/X(I,2)	013501
05436	2291*	50 CONTINUE	013505

B-45

```

05440 2292*      J=5                                         013505
05441 2293*      RETURN J                                     013507
05442 2294*      SUBROUTINE RAD(G,L,$)                      013565
05445 2295*      REAL G(340,2),L(340,2)                   013565
05446 2296*      DO 50 I=1,MAXELM                         013565
05451 2297*      G(I,1)=ABS(L(I,1))                      013611
05452 2298*      50 G(I,2)=L(I,2)                         013612
05454 2299*      J=3                                         013615
05455 2300*      RETURN J                                     013617
05455 2301*      C                                         ****
05455 2302*      C                                         *          *
05455 2303*      C                                         *  SUBROUTINE FILSUM  *
05455 2304*      C                                         *
05455 2305*      C                                         ****
05455 2306*      C                                         ****
05455 2307*      C                                         ****
05456 2308*      SUBROUTINE FILSUM(R,N,X,Y,Y1,Z,D,$)       013663
05456 2309*      C                                         -013663
05456 2310*      C THIS SUBROUTINE SUMS THE PRODUCTS OF EACH ELEMENT OF X,Y,Y1,Z,D ARRAYS 013663
05456 2311*      C                                         013663
05456 2312*      C                                         -013663
05461 2313*      DIMENSION R(340,2),                         013663
05461 2314*      1      X(340,2),                         -013663
05461 2315*      2      Y(340,2),                         -013663
05461 2316*      3      Y1(340,2),                        -013663
05461 2317*      4      Z(340,2),                         -013663
05461 2318*      5      D(340),                           -013663
05461 2319*      7      RLS(340,2),                        -013663
05461 2320*      6      T(340,2)                          -013663
05462 2321*      DO 10 I = 1,340                         013663
05465 2322*      IF(Y(I,1) .EQ. 0) GOTO 20                 013712
05467 2323*      T(I,1) = Y(I,1)                         013714
05470 2324*      T(I,2) = Y(I,2) * Y1(I,2)                  013716
05471 2325*      10 CONTINUE                            013724
05473 2326*      20 L = 8                                013724
05474 2327*      GOTO 30                               013725
05475 2328*      ENTRY FILSUB(R,N,X,T,Z,D,$)           013726
05477 2329*      L = 7                                013726
05500 2330*      30 N = N - 1                         013731
05501 2331*      R(N) = 0                             013733
05502 2332*      J = 1                                013737
05503 2333*      K = 1                                013741
05504 2334*      DO 110 I = 1,MAXELM                   013762
05507 2335*      40 IF(ABS(X(I,1)) .EQ. T(K,1)) GOTO 60   013762
05511 2336*      IF(ABS(X(I,1)) .LT. T(K,1)) GOTO 50   013766
05513 2337*      K = K +1                           013772
05514 2338*      GOTO 40                           013775
05515 2339*      50 CALL INTERP(X,T,I,K,A)            013777
05516 2340*      GOTO 70                           014005
05517 2341*      60 A = T(K,2)                         014007
05520 2342*      70 IF(ABS(X(I,1)) .EQ. Z(J,1)) GOTO 90   014013
05522 2343*      IF(ABS(X(I,1)) .LT. Z(J,1)) GOTO 80   014017
05524 2344*      J = J +1                           014023
05525 2345*      GOTO 70                           014026
05526 2346*      80 CALL INTERP(X,Z,I,J,B)            014030
05527 2347*      GOTO 100                          014036
05530 2348*      90 B = Z(J,2)                         014040
05531 2349*      100 RLS(I,1) = ABS(X(I,1))           014044

```

05532	2350*	RLS(I,2) = A * B	014045
05533	2351*	110 CONTINUE	014052
05535	2352*	R(N) = SUM(X,RLS,D)	014052
05536	2353*	RETURN L	014060
05536	2354*	C	014060
05536	2355*	C ****	014060
05536	2356*	C * *	014060
05536	2357*	C * FUNCTION SEQUEN *	014060
05536	2358*	C *	014060
05536	2359*	C ****	014060
05536	2360*	C	014060
05537	2361*	REAL FUNCTION SEQUEN(X,I,Y,J)	014203
05537	2362*	C	014203
05537	2363*	C THIS FUNCTION RETURNS THE VALUE IN Y(I,2) FOR WHICH Y(I,1) MATCHES X(I,1)	014203
05537	2364*	C	014203
05542	2365*	DIMENSION X(340,2),	014203
05542	2366*	Y(340,2)	014203
05543	2367*	10 IF(ABS(X(I,1)) .EQ. Y(J,1)) GOTO 20	014203
05545	2368*	IF(Y(J,1).EQ.1405) GO TO 35	014213
05547	2369*	IF(ABS(X(I,1)) .LT. Y(J,1)) GOTO 30	014216
05551	2370*	J = J + 1	014222
05552	2371*	GOTO 10	014225
05553	2372*	20 SEQUEN = Y(J,2)	014227
05554	2373*	GOTO 40	014232
05555	2374*	30 CALL INTERP(X,Y,I,J,SEQUEN)	014234
05556	2375*	IF(SEQUEN.NE.0) IFLAG=1	014242
05560	2376*	GO TO 40	014246
05561	2377*	35 SEQUEN=0.	014250
05562	2378*	40 RETURN	014251
05562	2379*	C ****	014251
05562	2380*	C	014251
05562	2381*	C *	014251
05562	2382*	C * SUBROUTINE PRTCON *	014251
05562	2383*	C *	014251
05562	2384*	C ****	014251
05562	2385*	C	014251
05563	2386*	SUBROUTINE PRTCON	014305
05563	2387*	C	014305
05563	2388*	C CONTROL THE PRINTING OF THE LISTING	014305
05563	2389*	C	014305
05566	2390*	LYNE = LYNE + 2	014305
05567	2391*	IF(PKCON.NE.1) GO TO 10	014310
05571	2392*	IF((LYNE+8).GT.LINMAX) GO TO 40	014313
05573	2393*	CALL HEADIN	014317
05574	2394*	LYNE=LYNE + 9	014321
05575	2395*	GO TO 60	014324
05575	2396*	C	014324
05576	2397*	10. IF(LYNE.LT.LINMAX) GO TO 60	014326
05600	2398*	PAGE=PAGE+1	014331
05601	2399*	CALL HEADIN	014334
05602	2400*	LYNE=12	014336
05603	2401*	GO TO 60	014340
05603	2402*	C	014340
05604	2403*	40 PKCON=3	014342
05605	2404*	PAGE=PAGE+1	014343
05606	2405*	CALL HEADIN	014346
05607	2406*	LYNE=17	014350
05607	2407*	C	014350

05610	2408*	60 RETURN	-014353
05610	2409*	C	-014353
05610	2410*	C	-014353
05610	2411*	C	-014353
05610	2412*	C	-014353
05610	2413*	C	-014353
05610	2414*	C	-014353
05610	2415*	C	-014353
05611	2416*	SUBROUTINE HEADING	-014363
05611	2417*	C	-014363
05611	2418*	C	-014363
05611	2419*	C	-014363
05614	2420*	INTEGER PRTFT(4)	-014363
05615	2421*	IF(PKCON.EQ.1) GO TO 1	-014363
05617	2422*	GO TO 2	014366
05620	2423*	1 PRINT 1347	014370
05622	2424*	PKCON=2	014373
05623	2425*	GO TO 80	014375
05624	2426*	2 PRINT 10,DATE,PAGE	014377
05630	2427*	PRINT 20,DESCRP	014407
05633	2428*	PRINT 30,EVENT	014416
05636	2429*	PRINT 35,OMEGA,CM,FIG	014425
05643	2430*	35 FORMAT(' SOURCE SOLID ANGLE IS ',1PE9.2,', AT A MEASUREMENT ',	014434
05643	2431*	1 'DISTANCE OF ',A5,' CM. FIGURE NO. ',A2)	014434
05644	2432*	IF(PKCON.EQ.0) GO TO 4	014434
05646	2433*	IF(PKCON.EQ.3) PRINT 1347	014436
05651	2434*	PRINT 39	014445
05653	2435*	PKCON=2	014451
05654	2436*	GO TO 5	014453
05655	2437*	4 PRINT 40	014455
05657	2438*	5 PRINT 50	014461
05657	2439*	C	014461
05661	2440*	PRTFT(1)=' '	014464
05662	2441*	PRTFT(2)=' '	014466
05663	2442*	PRTFT(3)=' '	014467
05664	2443*	PRTFT(4)=' '	014470
05665	2444*	IF(NUMFIL.EQ.0) GO TO 55	014471
05667	2445*	PRTFT(1)='E*FT1'	014473
05670	2446*	PRTFT(2)='E*FT2'	014475
05671	2447*	PRTFT(3)='E*FT1*'	014477
05672	2448*	PRTFT(4)='FT2'	014501
05673	2449*	IF(NUMFIL.NE.1) GO TO 54	014503
05675	2450*	PRTFT(1)=' FT1'	014506
05676	2451*	PRTFT(2)='E*FT1'	014510
05677	2452*	PRTFT(3)=' '	014511
05700	2453*	PRTFT(4)=' '	014512
05701	2454*	GO TO 55	014513
05702	2455*	54 IF(NUMFIL.NE.3) GO TO 55	014515
05704	2456*	PRTFT(3)=' E*FT'	014517
05705	2457*	PRTFT(4)='3'	014521
05706	2458*	55 CONTINUE	014524
05707	2459*	IX=GENWEI + 1	014524
05710	2460*	IF(NUMFIL.EQ.3.AND.IX.EQ.19) IX=20	014526
05712	2461*	PRINT 60,(PRTLAM(IX,I),I=1,3),(PRTFT(I),I=1,4)	014544
05721	2462*	PRINT 70	014563
05723	2463*	10 FORMAT('1',T2,'LMD SPECTRAL WEIGHTING PROGRAM',T90,'DATE ',2A6,	014570
05723	2464*	1T110,'PAGE ',I3)	014570
05724	2465*	20 FORMAT('0',T2,13A6,A2/T2,13A6,A2)	014570

```

05725 2466*      30 FORMAT(' ',T2,3A6)
05726 2467*      39 FORMAT('0',T31, 'ADJUSTED LINE LINE LINE-RETIN
05726   2468*      1AL GENERAL LINE IRRADIANCE')
05727 2469*      1347 FORMAT(10X,/,22X,'INDIVIDUAL LINE IRRADIANCES: PEAK SPECTRAL IRR
05727   2470*      1DIANCE TIMES BANDWIDTH OF MONOCHROMETER',//)
05729 2471*      40 FORMAT('0',T31, 'ADJUSTED SPECTRAL SPECTRAL SPECTRAL-RETIN
05730 2472*      1AL GENERAL SPECTRAL IRRADIANCE')
05731 2473*      50 FORMAT(' ',T3,'WAVE CALIBRAT INSTRUMENT INSTRUMENT IRRADIANCE
05731   2474*      1RADIANCE IRRADIANCE WEIGHTING THROUGH '
05731   2475*      2'FILTER(S)')
05732 2476*      60 FORMAT(' ',T2,'LENGTH FACTOR READINGS READINGS SOURCE
05732   2477*      1 SOURCE (3-MM) (7-MM)',2A6,A2,T100,A6,3X,A6,3X,2A6)
05733 2478*      70 FORMAT(' ',T2,'----',11(2X,9('---')))
05734 2479*      80 RETURN

05734 2480*      C
05734 2481*      C      *****
05734 2482*      C      *
05734 2483*      C      * SUBROUTINE BDREAD *
05734 2484*      C      *
05734 2485*      C      *****
05734 2486*      C
05735 2487*      SUBROUTINE BDREAD(TABLE)
05735 2488*      C
05735 2489*      C      SUBROUTINE READS BIODECK DATA THAT IS ON SEPARATE CARDS
05735 2490*      C
05740 2491*      DIMENSION TABLE(340,2)
05741 2492*      DO 20 I = 1,340
05744 2493*      READ(5,10,ERR=30)(TABLE(I,J),J=1,2)
05752 2494*      10 FORMAT(F4.0,T9,E9.2)
05753 2495*      20 CONTINUE
05755 2496*      GOTO 50
05756 2497*      30 READ(0,40) M
05761 2498*      40 FORMAT(A3)
05762 2499*      TABLE(I,1)=1405
05763 2500*      IF(M .EQ. 'END') GOTO 70
05765 2501*      50 PRINT 60
05767 2502*      60 FORMAT('0 BIODECK DID NOT END CORRECTLY')
05770 2503*      STOP
05771 2504*      70 RETURN

05771 2505*      C
05771 2506*      C      *****
05771 2507*      C      *
05771 2508*      C      * SUBROUTINE BLKBDY *
05771 2509*      C      *
05771 2510*      C      *****
05771 2511*      C
05772 2512*      SUBROUTINE BLKBDY(E,D,T)
05772 2513*      C
05772 2514*      C      SUBROUTINE CALCULATES BLACKBODY SPECTRUM FOR ANY TEMPERTURE
05772 2515*      C
05775 2516*      DIMENSION E(340,2),D(340)
05776 2517*      REAL IX
05777 2518*      DO 2 I=1,241
06002 2519*      IX=195 + 5*I
06003 2520*      E(I,1)=IX
06004 2521*      E(I,2)=BLACK(IX,T)
06005 2522*      EINSTR(I,1)=IX
06006 2523*      EINSTR(I,2)=E(I,2)

```


B-50

06120	2582*	CALL PLOT(-0.89,7.1,-3)	015254
06121	2583*	GOTO 5	015261
06122	2584*	60 CALL PLOT(10.15,-36.,-3)	015263
06123	2585*	CALL PLOT(0.,1.2,-3)	015267
06124	2586*	5 NPLOT = NPLOT + 1	015275
06124	2587*	C DRAW BORDER, HAVING ESTABLISHED LOWER LEFT CORNER	015275
06125	2588*	CALL PLOT(0.,8.,2)	015277
06126	2589*	CALL PLOT(10.5,8.,2)	015304
06127	2590*	CALL PLOT(10.5,0.,2)	015311
06130	2591*	CALL PLOT(0.,0.,2)	015316
06131	2592*	CALL PLOT(0.89,1.3,-3)	015323
06131	2593*	C LABEL GRAPH	015323
06131	2594*	C	015323
06132	2595*	IF(FVENT(1).NE.'GLAMBD') GO TO 100	015330
06134	2596*	GLINE(1)='FUNCTI'	015333
06135	2597*	GLINE(2)='ON PLO'	015335
06136	2598*	GLINE(3)='TTED:'	015337
06137	2599*	GLINE(4)='IRRADI'	015341
06140	2600*	GLINE(5)='ANCE +'	015343
06141	2601*	GLINE(6)=FVENT(2)	015345
06142	2602*	GLINE(7)=FVENT(3)	015347
06143	2603*	GLINE(8)=FVENT(4)	015351
06144	2604*	GLINE(9)=' FOR'	015353
06145	2605*	GLINE(10)=EVENT(1)	015355
06146	2606*	GLINE(11)=EVENT(2)	015357
06147	2607*	GLINE(12)=EVENT(3)	015361
06150	2608*	IJ=FVENT(2)	015363
06151	2609*	IF(IJ.NE.' RADI'.AND.IJ.NE.' FIL'.AND.IJ.NE.' BOTH'.AND.	015364
06151	2610*	1 IJ.NE.' FILTE'.AND.IJ.NE.'BLUE R'.AND.IJ.NE.' CALIB') GO TO 80	015364
06153	2611*	GLINE(4)=FVENT(2)	015431
06154	2612*	GLINE(5)=FVENT(3)	015433
06155	2613*	GLINE(6)=FVENT(4)	015435
06156	2614*	GLINE(7)=' '	015436
06157	2615*	GLINE(8)=' '	015440
06160	2616*	IF(IJ.EQ.' CALIB') GO TO 80	015441
06162	2617*	IF(IJ.EQ.' RADI'.OR.IJ.EQ.'BLUE R') GO TO 80	015444
06164	2618*	GLINE(7)=' TRANS'	015460
06165	2619*	GLINE(8)='MISSIO'	015462
06166	2620*	GLINE(9)='N'	015464
06167	2621*	GLINE(10)=' '	015466
06170	2622*	GLINE(11)=' '	015467
06171	2623*	GLINE(12)=' '	015470
06172	2624*	80 CONTINUE	015472
06173	2625*	CALL SYMBOL(0.12,-0.9,0.14,GLINE,0.,72)	015472
06174	2626*	GO TO 110	015501
06175	2627*	100 CONTINUE	015503
06176	2628*	CALL SYMBOL(-0.4,-0.8,0.14,EVENT2,0.,72)	015503
06177	2629*	CALL SYMBOL(0.58,-0.8,0.14,FIG,0.,2)	015512
06200	2630*	CALL SYMBOL(5.32,-0.8,0.14,CM,0.,5)	015522
06201	2631*	CALL SYMBOL(-0.4,-1.1,0.14,FVENT,0.,36)	015532
06202	2632*	110 CONTINUE	015543
06202	2633*	C DRAW,NUMBER,LABEL X-AXIS	015543
06203	2634*	CALL PLOT(0.,0.,3)	015543
06204	2635*	CALL PLOT(9.,0.,2)	015547
06205	2636*	MW=3	015554
06206	2637*	IF(XAXIS(ISIZE).GT.410.) MW=7	015556
06210	2638*	IF(XAXIS(ISIZE).GT.810.) MW=11	015567
06212	2639*	IF(XAXIS(ISIZE).GT.1210.) MW=13	015576

B-51

06214	2640*	DO 55 I=1,MW	015605
06217	2641*	X = (I-1) * 9. / (MW-1)	015615
06220	2642*	CALL PLOT(X,0.,3)	015625
06221	2643*	CALL PLOT(X,-0.06,2)	015632
06222	2644*	X = X - 0.07	015637
06223	2645*	FPN = (I+1) * 100.	015642
06224	2646*	55 CALL NUMBER(X,-0.26,0.14,FPN,0.,-1)	015651
06226	2647*	CALL SYMBOL(3.5,-0.48,0.14,30HSPECTRAL WAVELENGTH (NM),0.,15)	015663
06226	2648*	C SET PARAMETERS FOR LINE GRAPH	015663
06227	2649*	XAXIS(ISIZE+1) = 200.	015673
06230	2650*	XAXIS(ISIZE + 2) = 100. * (MW-1) / 9.	015676
06230	2651*	C Y-AXIS ROUTINES	015676
06230	2652*	C ISIZE JOCKEYED TO ELIMINATE REDUNDANT SCALING	015676
06231	2653*	ISIZE = ISIZE/2	015702
06232	2654*	IF (LINLOG.EQ.2) GO TO 61	015705
06234	2655*	IF (LINLOG.EQ.1) GO TO 120	015710
06236	2656*	IF (MOD(NPLOT,2) .EQ. 0) GOTO 61	015713
06240	2657*	120 CONTINUE	015721
06241	2658*	CALL SCALE(YAXIS,6.,ISIZE,2) @ LINEAR	015721
06242	2659*	ISIZE = ISIZE*2	015726
06243	2660*	YAXIS(ISIZE+2) = YAXIS(ISIZE+3)	015731
06243	2661*	C IF(FVENT(1).NE.'GLAMBD') GO TO 200	015731
06244	2662*	IF(IJ.NE.' RADI') GO TO 90	015734
06246	2663*	CALL AXIS(0.,0.,30HSPECTRAL RADIANCE [W/(CM NM)],	015737
06250	2664*	A 30,6.,90.,YAXIS(ISIZE+1),YAXIS(ISIZE+2))	015742
06251	2666*	CALL SYMBOL(-0.36,4.22,0.07,3H2 ,.90.,3)	015742
06252	2667*	GO TO 210	015760
06253	2668*	90 CONTINUE	015770
06254	2669*	CALL AXIS(0.,0.,36HSPECTRAL FUNCTION, NO ASSIGNED UNITS,36,6.,	015772
06254	2670*	A 90.,YAXIS(ISIZE+1),YAXIS(ISIZE+2))	015772
06255	2671*	GO TO 210	016010
06256	2672*	200 CONTINUE	016012
06257	2673*	CALL AXIS(0.,0.,30HSPECTRAL IRRADIANCE (W/CM /NM),	016012
06257	2674*	A 30,6.,90.,YAXIS(ISIZE+1),YAXIS(ISIZE+2))	016012
06260	2675*	CALL SYMBOL(-0.36,3.94,0.07,1H2,90.,1)	016030
06261	2676*	210 CONTINUE	016041
06262	2677*	CALL LINE(XAXIS,YAXIS,ISIZE,1,0,0)	016041
06263	2678*	IF(LINLOG.EQ.1) GO TO 4	016050
06265	2679*	GOTO 63	016053
06266	2680*	61 CALL SCALG(YAXIS,6.,ISIZE,2) @ LOGARITHMIC	016055
06267	2681*	ISIZE = ISIZE*2	016062
06267	2682*	C DRAW,LABEL Y-AXIS	016062
06270	2683*	CALL PLOT(0.,0.,3)	016065
06271	2684*	CALL PLOT(0.,6.,2)	016072
06272	2685*	IF(FVENT(1).EQ.'GLAMBD') GO TO 220	016077
06274	2686*	CALL SYMBOL(-0.60,0.9,0.14,30HSPECTRAL IRRADIANCE (W/CM /NM),	016102
06274	2687*	A 90.,.30)	016102
06275	2688*	CALL SYMBOL(-0.705,4.43,0.07,1H2,90.,1)	016112
06276	2689*	GO TO 230	016122
06277	2690*	220 CONTINUE	016124
06300	2691*	IF(IJ.NE.' RADI') GO TO 225	016124
06302	2692*	CALL SYMBOL(-0.60,0.9,0.14,30HSPECTRAL RADIANCE [W/CM NM]),90.,	016126
06302	2693*	130)	016126
06303	2694*	CALL SYMBOL(-0.705,4.18,0.07,1H2,90.,1)	016136
06304	2695*	GO TO 230	016146
06305	2696*	225 CONTINUE	016150
06306	2697*	CALL SYMBOL(-0.60,0.9,0.14,36HSPECTRAL FUNCTION, NO ASSIGNED UNITS	016150

06306	2698*	1,90.,36)	016150
06307	2699*	230 CONTINUE	016160
06307	2700*	C PLOT BOTTOM TICK AND NUMBER	016160
06310	2701*	CALL PLOT(0.,0.,3)	016160
06311	2702*	CALL PLOT(-0.12,0.,2)	016164
06312	2703*	CALL NUMBER(-0.57,0.,0.14,10.,0.,-1)	016171
06313	2704*	FPN = ALOG10(YAXIS(ISIZE+1))	016201
06314	2705*	CALL NUMBER(-0.305,0.105,0.07,FPN,0.,-1)	016210
06314	2706*	C PLOT REMAINING TICKS AND NUMBERS	016210
06315	2707*	II = 6. * YAXIS(ISIZE+3) @ NUMBER OF CYCLES	016220
06316	2708*	YY = 0.	016231
06317	2709*	DO 57 I = 1,II	016241
06322	2710*	DO 56 J = 2,9	016241
06325	2711*	X = YY + ALOG10(J)/YAXIS(ISIZE+3)	016241
06326	2712*	CALL PLOT(0.,X,3)	016252
06327	2713*	56 CALL PLOT(-0.06,X,2)	016257
06331	2714*	YY = I/YAXIS(ISIZE+3) @ INCH-ORDINATE OF END OF ITH CYCLE	016266
06332	2715*	CALL PLOT(0.,YY,3)	016273
06333	2716*	CALL PLOT(-0.12,YY,2)	016300
06334	2717*	CALL NUMBER(-0.57,YY,0.14,10.,0.,-1)	016305
06335	2718*	FPN = FPN + 1.	016315
06336	2719*	57 CALL NUMBER(-0.305,YY+0.105,0.07,FPN,0.,-1)	016320
06340	2720*	YAXIS(ISIZE+2) = YAXIS(ISIZE+3)	016335
06341	2721*	CALL LGLIN(XAXIS,YAXIS,ISIZE,1,0.,0,1)	016337
06342	2722*	GOTO 4	016350
06342	2723*	C END PLOT ROUTINE	016350
06343	2724*	999 CALL PLOT(12.,-36.,-3)	016352
06344	2725*	CALL PLOT(0.,0.5,-3)	016356
06345	2726*	CALL PLOT(0.,35.,2)	-016363
06346	2727*	CALL PLOT(2.,-36.,999)	016370
06347	2728*	RETURN	016375
06350	2729*	END	016430

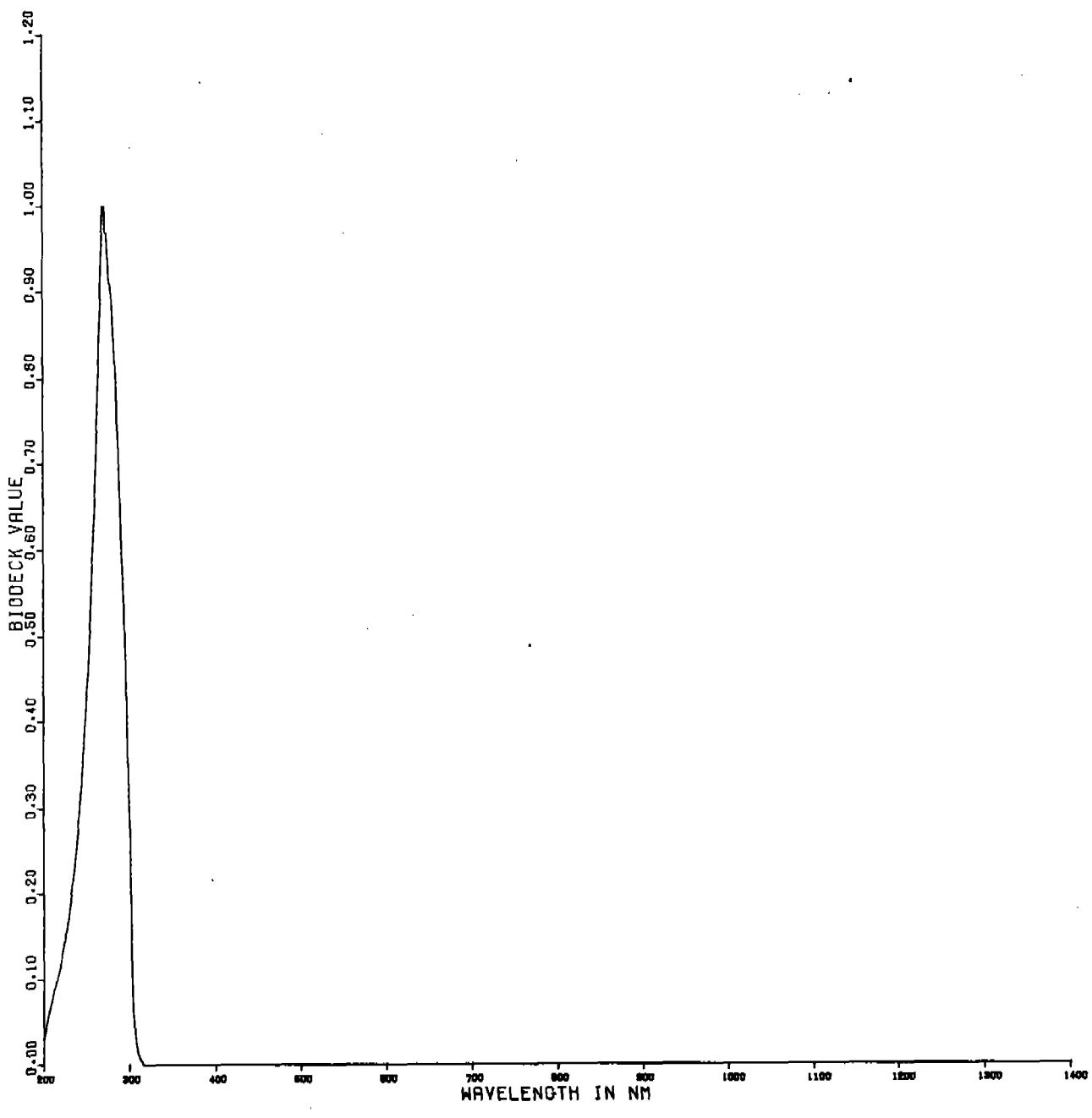
END OF COMPILATION: NO DIAGNOSTICS.

EBRKPT PRINTS

λ	S_λ	U_λ	V_λ	V'_λ	T_λ	$T \cdot A_{PE_\lambda}$	R_λ	A_λ	λ	P_{445_λ}	P_{555_λ}	P_{575_λ}
1	200	3.00E-02	0.0	0.0	0.0	0.0	0.0	1.00				
2	201	3.40E-02	0.0	0.0	0.0	0.0	0.0	1.0				
3	202	3.80E-02	0.0	0.0	0.0	0.0	0.0	1.0				
4	203	4.20E-02	0.0	0.0	0.0	0.0	0.0	1.0				
5	204	4.70E-02	0.0	0.0	0.0	0.0	0.0	1.00				
6	205	5.10E-02	0.0	0.0	0.0	0.0	0.0	1.00				
7	206	5.50E-02	0.0	0.0	0.0	0.0	0.0	1.0	410	5.70E-01		
8	207	6.10E-02	0.0	0.0	0.0	0.0	0.0	1.0	420	8.15E-01		
9	208	6.60E-02	0.0	0.0	0.0	0.0	0.0	1.0	430	9.25E-01	2.20E-01	
10	209	7.10E-02	0.0	0.0	0.0	0.0	0.0	1.00	440	9.91E-01	2.80E-01	
11	210	7.50E-02	0.0	0.0	0.0	0.0	0.0	1.00	450	9.80E-01	3.30E-01	8.00E-02
12	211	7.90E-02	0.0	0.0	0.0	0.0	0.0	1.0	450	8.80E-01	4.20E-01	1.30E-01
13	212	8.30E-02	0.0	0.0	0.0	0.0	0.0	1.0	470	7.30E-01	5.10E-01	2.00E-01
14	213	8.70E-02	0.0	0.0	0.0	0.0	0.0	1.0	480	5.30E-01	6.10E-01	2.60E-01
15	214	9.10E-02	0.0	0.0	0.0	0.0	0.0	1.0	490	3.30E-01	7.20E-01	3.50E-01
16	215	9.50E-02	0.0	0.0	0.0	0.0	0.0	1.00	500	1.80E-01	8.20E-01	4.50E-01
17	216	1.00E-01	0.0	0.0	0.0	0.0	0.0	1.0	510	9.00E-02	9.00E-01	5.40E-01
18	217	1.05E-01	0.0	0.0	0.0	0.0	0.0	1.0	520	5.00E-02	9.60E-01	6.20E-01
19	218	1.10E-01	0.0	0.0	0.0	0.0	0.0	1.0	530	3.00E-02	9.93E-01	7.10E-01
20	219	1.15E-01	0.0	0.0	0.0	0.0	0.0	1.0	540	9.90E-01	8.00E-01	
21	220	1.20E-01	0.0	0.0	0.0	0.0	0.0	1.00	550	9.40E-01	8.10E-01	
22	221	1.25E-01	0.0	0.0	0.0	0.0	0.0	1.0	560	8.60E-01	9.30E-01	
23	222	1.31E-01	0.0	0.0	0.0	0.0	0.0	1.0	570	7.40E-01	9.90E-01	
24	223	1.37E-01	0.0	0.0	0.0	0.0	0.0	1.0	580	6.10E-01	9.90E-01	
25	224	1.43E-01	0.0	0.0	0.0	0.0	0.0	1.0	590	4.70E-01	9.40E-01	
26	225	1.50E-01	0.0	0.0	0.0	0.0	0.0	1.00	600	3.60E-01	8.10E-01	
27	226	1.57E-01	0.0	0.0	0.0	0.0	0.0	1.0	610	2.40E-01	7.00E-01	
28	227	1.64E-01	0.0	0.0	0.0	0.0	0.0	1.0	620	1.80E-01	5.50E-01	
29	228	1.71E-01	0.0	0.0	0.0	0.0	0.0	1.0	630	1.00E-01	4.20E-01	
30	229	1.78E-01	0.0	0.0	0.0	0.0	0.0	1.0	640	7.00E-02	2.90E-01	
31	230	1.85E-01	0.0	0.0	0.0	0.0	0.0	1.00	650	4.00E-02	1.70E-01	
32	231	1.96E-01	0.0	0.0	0.0	0.0	0.0	1.0	660	3.00E-02	8.00E-02	
33	232	2.06E-01	0.0	0.0	0.0	0.0	0.0	1.0	670	2.00E-02	2.00E-02	
34	233	2.16E-01	0.0	0.0	0.0	0.0	0.0	1.0	680	1.00E-02	9.00E-03	
35	234	2.27E-01	0.0	0.0	0.0	0.0	0.0	1.0				
36	235	2.38E-01	0.0	0.0	0.0	0.0	0.0	1.00				
37	236	2.50E-01	0.0	0.0	0.0	0.0	0.0	1.0				
38	237	2.62E-01	0.0	0.0	0.0	0.0	0.0	1.0				
39	238	2.75E-01	0.0	0.0	0.0	0.0	0.0	1.0				
40	239	2.87E-01	0.0	0.0	0.0	0.0	0.0	1.0				
41	240	3.00E-01	5.60E-01	0.0	0.0	0.0	0.0	1.00				
42	241	3.12E-01	5.60E-01	0.0	0.0	0.0	0.0	1.0				
43	242	3.25E-01	5.60E-01	0.0	0.0	0.0	0.0	1.0				
44	243	3.37E-01	5.70E-01	0.0	0.0	0.0	0.0	1.0				
45	244	3.46E-01	5.70E-01	0.0	0.0	0.0	0.0	1.0				
46	245	3.51E-01	5.80E-01	0.0	0.0	0.0	0.0	1.00				
47	246	3.70E-01	5.80E-01	0.0	0.0	0.0	0.0	1.0				
48	247	3.86E-01	5.80E-01	0.0	0.0	0.0	0.0	1.0				
49	248	3.99E-01	5.80E-01	0.0	0.0	0.0	0.0	1.0				
50	249	4.13E-01	5.80E-01	0.0	0.0	0.0	0.0	1.0				
51	250	4.29E-01	5.70E-01	0.0	0.0	0.0	0.0	1.00				
52	251	4.45E-01	5.60E-01	0.0	0.0	0.0	0.0	1.0				
53	252	4.62E-01	5.60E-01	0.0	0.0	0.0	0.0	1.0				
54	253	4.80E-01	5.50E-01	0.0	0.0	0.0	0.0	1.0				
55	254	5.00E-01	5.40E-01	0.0	0.0	0.0	0.0	1.0				
56	255	5.22E-01	5.30E-01	0.0	0.0	0.0	0.0	1.00				
57	256	5.46E-01	5.20E-01	0.0	0.0	0.0	0.0	1.0				
58	257	5.71E-01	5.20E-01	0.0	0.0	0.0	0.0	1.0				
59	258	5.97E-01	4.80E-01	0.0	0.0	0.0	0.0	1.0				
60	259	6.24E-01	4.50E-01	0.0	0.0	0.0	0.0	1.0				
61	260	6.52E-01	4.20E-01	0.0	0.0	0.0	0.0	1.00				
62	261	6.81E-01	4.00E-01	0.0	0.0	0.0	0.0	1.00				
63	262	7.11E-01	3.60E-01	0.0	0.0	0.0	0.0	1.0				
64	263	7.42E-01	3.20E-01	0.0	0.0	0.0	0.0	1.0				
65	264	7.75E-01	2.90E-01	0.0	0.0	0.0	0.0	1.0				
66	265	8.09E-01	2.60E-01	0.0	0.0	0.0	0.0	1.00				
67	266	8.44E-01	2.30E-01	0.0	0.0	0.0	0.0	1.0				
68	267	8.61E-01	2.10E-01	0.0	0.0	0.0	0.0	1.0				
69	268	9.19E-01	1.80E-01	0.0	0.0	0.0	0.0	1.0				
70	269	9.59E-01	1.60E-01	0.0	0.0	0.0	0.0	1.0				
71	270	1.00	1.40E-01	0.0	0.0	0.0	0.0	1.00				
72	271	9.96E-01	1.30E-01	0.0	0.0	0.0	0.0	1.0				
73	272	9.90E-01	1.10E-01	0.0	0.0	0.0	0.0	1.0				
74	273	9.81E-01	1.00E-01	0.0	0.0	0.0	0.0	1.0				
75	274	9.71E-01	9.00E-02	0.0	0.0	0.0	0.0	1.0				
76	275	9.59E-01	7.40E-02	0.0	0.0	0.0	0.0	1.00				
77	276	9.45E-01	6.80E-02	0.0	0.0	0.0	0.0	1.0				
78	277	9.30E-01	6.40E-02	0.0	0.0	0.0	0.0	1.0				
79	278	9.15E-01	6.20E-02	0.0	0.0	0.0	0.0	1.0				
80	279	8.99E-01	6.10E-02	0.0	0.0	0.0	0.0	1.0				
81	280	8.82E-01	6.00E-02	0.0	0.0	0.0	0.0	1.00				
82	281	8.64E-01	5.10E-02	0.0	0.0	0.0	0.0	1.0				
83	282	8.42E-01	5.20E-02	0.0	0.0	0.0	0.0	1.0				
84	283	8.16E-01	5.60E-02	0.0	0.0	0.0	0.0	1.0				
85	284	7.93E-01	7.60E-02	0.0	0.0	0.0	0.0	1.0				
86	285	7.65E-01	9.00E-02	0.0	0.0	0.0	0.0	1.00				
87	286	7.43E-01	1.10E-01	0.0	0.0	0.0	0.0	1.0				
88	287	7.13E-01	1.30E-01	0.0	0.0	0.0	0.0	1.0				
89	288	6.87E-01	1.70E-01	0.0	0.0	0.0	0.0	1.0				
90	289	6.62E-01	2.20E-01	0.0	0.0	0.0	0.0	1.0				
91	290	6.38E-01	3.10E-01	0.0	0.0	0.0	0.0	1.00				
92	291	6.18E-01	4.60E-01	0.0	0.0	0.0	0.0	1.0				
93	292	6.00E-01	6.40E-01	0.0	0.0	0.0	0.0	1.0				
94	293	5.82E-01	8.20E-01	0.0	0.0	0.0	0.0	1.0				
95	294	5.61E-01	9.20E-01	0.0	0.0	0.0	0.0	1.0				
96	295	5.35E-01	9.80E-01	0.0	0.0	0.0	0.0	1.00				
97	296	5.02E-01	9.90E-01	0.0	0.0	0.0	0.0	1.0				
98	297	4.61E-01	1.00	0.0	0.0	0.0	0.0	1.0				
99	298	4.13E-01	9.80E-01	0.0	0.0	0.0	0.0	1.0				
100	299	3.58E-01	9.00E-01	0.0	0.0	0.0	0.0	1.0				
101	300	3.20E-01	8.30E-01	0.0	0.0	0.0	0.0	1.00				
102	301	2.34E-01	7.20E-01	0.0	0.0	0.0	0.0	1.0				
103	302	1.69E-01	6.00E-01	0.0</								

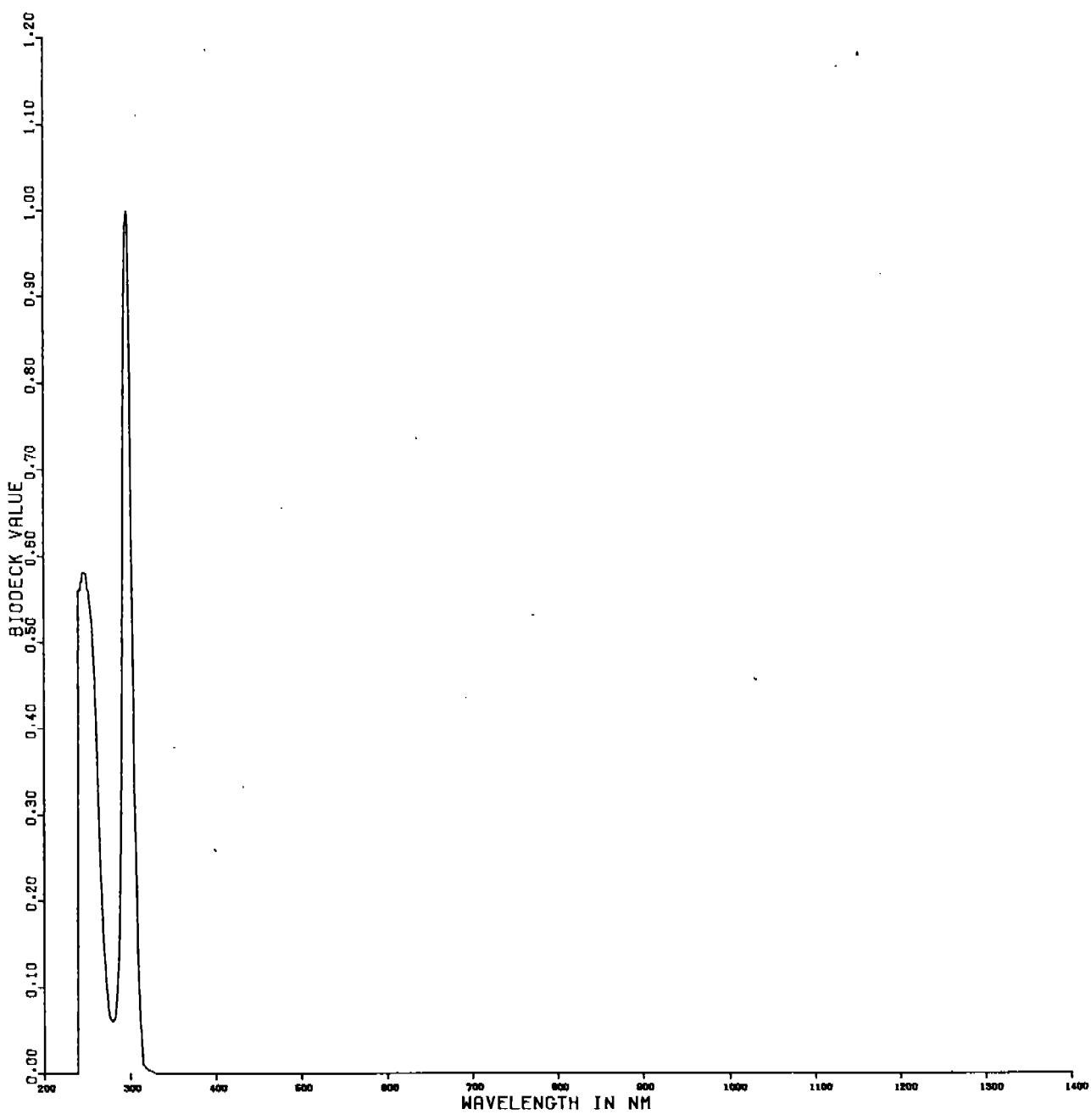
λ	S_λ	U_λ	V_λ	V'_λ	T_λ	$T \cdot A_{PE_\lambda}$	R_λ	A_λ	B_λ	X_λ	Y_λ	Z_λ
116	315	3.00E-03	1.00E-02	0.0	0.0	0.0	0.0	0.0	3.00E-03			
117	316	2.00E-03	9.10E-03	0.0	0.0	0.0	0.0	0.0				
118	317	1.50E-03	8.00E-03	0.0	0.0	0.0	0.0	0.0				
119	318	1.00E-03	6.80E-03	0.0	0.0	0.0	0.0	0.0				
120	319	0.0	5.60E-03	0.0	0.0	0.0	0.0	0.0				
121	320	0.0	5.00E-03	0.0	0.0	0.0	0.0	0.0				
122	321	0.0	4.20E-03	0.0	0.0	0.0	0.0	0.0				
123	322	0.0	3.60E-03	0.0	0.0	0.0	0.0	0.0				
124	325	0.0	3.00E-03	0.0	0.0	0.0	0.0	0.0				
125	330	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
126	335	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
127	340	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
128	345	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
129	350	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
130	355	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
131	360	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
132	365	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
133	370	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
134	375	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
135	380	0.0	0.0	4.00E-05	5.89E-04	0.0	0.0	0.0				
136	385	0.0	0.0	6.80E-05	1.00E-03	0.0	0.0	0.0				
137	390	0.0	0.0	1.20E-04	2.21E-03	1.00E-02	0.0	0.0				
138	395	0.0	0.0	1.85E-04	4.00E-03	5.00E-02	0.0	0.0				
139	400	0.0	0.0	4.00E-04	9.29E-03	8.00E-02	0.0	1.00				
140	405	0.0	0.0	5.80E-04	1.80E-02	1.10E-01	1.00E-02	2.00				
141	410	0.0	0.0	1.20E-03	3.48E-02	2.20E-01	5.00E-02	4.00				
142	415	0.0	0.0	2.00E-03	5.00E-02	2.80E-01	8.40E-02	8.00				
143	420	0.0	0.0	2.00E-03	9.66E-02	3.30E-01	2.00E-01	9.00				
144	425	0.0	0.0	6.50E-03	1.48E-01	3.60E-01	2.50E-01	9.50				
145	430	0.0	0.0	1.16E-02	2.00E-01	4.20E-01	3.00E-01	9.80				
146	435	0.0	0.0	1.70E-02	2.75E-02	4.60E-01	3.70E-01	1.00E+01	0.0			
147	440	0.0	0.0	2.30E-02	3.26E-01	5.00E-01	4.50E-01	1.00E+01	0.0			
148	445	0.0	0.0	3.00E-02	4.00E-01	5.70E-01	5.20E-01	9.70				
149	450	0.0	0.0	3.80E-02	4.35E-01	6.30E-01	5.80E-01	9.40				
150	455	0.0	0.0	5.00E-02	5.00E-01	6.50E-01	6.00E-01	9.0				
151	460	0.0	0.0	6.00E-02	5.67E-01	6.80E-01	6.20E-01	8.0				
152	465	0.0	0.0	7.20E-02	6.40E-01	6.90E-01	6.40E-01	7.0				
153	470	0.0	0.0	9.10E-02	6.76E-01	7.10E-01	6.50E-01	6.2				
154	475	0.0	0.0	1.05E-01	7.30E-01	7.20E-01	6.60E-01	5.5				
155	480	0.0	0.0	1.39E-01	7.93E-01	7.40E-01	6.70E-01	4.50				
156	485	0.0	0.0	1.62E-01	8.50E-01	7.60E-01	8.80E-01	4.0				
157	490	0.0	0.0	2.00E-01	9.04E-01	7.70E-01	6.90E-01	2.2				
158	495	0.0	0.0	2.50E-01	9.50E-01	7.90E-01	7.00E-01	1.6				
159	500	0.0	0.0	3.23E-01	9.82E-01	8.10E-01	7.10E-01	1.0				
160	505	0.0	0.0	4.00E-01	1.0	8.20E-01	7.20E-01	0.0				
161	510	0.0	0.0	5.03E-01	9.97E-01	8.40E-01	7.20E-01	1.0				
162	515	0.0	0.0	6.20E-01	9.75E-01	8.60E-01	7.20E-01	1.0				
163	520	0.0	0.0	7.10E-01	9.35E-01	8.70E-01	7.30E-01	1.0				
164	525	0.0	0.0	8.00E-01	9.00E-01	8.80E-01	7.30E-01	1.0				
165	530	0.0	0.0	8.62E-01	8.11E-01	8.90E-01	7.30E-01	1.0				
166	535	0.0	0.0	9.25E-01	7.50E-01	8.90E-01	7.40E-01	1.0				
167	540	0.0	0.0	9.54E-01	6.50E-01	9.00E-01	7.40E-01	1.0				
168	545	0.0	0.0	9.60E-01	5.60E-01	9.15E-01	7.40E-01	1.0				
169	550	0.0	0.0	9.95E-01	4.81E-01	9.20E-01	7.50E-01	1.0				
170	555	0.0	0.0	1.0	3.80E-01	9.20E-01	7.50E-01	1.0				
171	560	0.0	0.0	9.95E-01	3.29E-01	9.30E-01	7.50E-01	1.0				
172	565	0.0	0.0	9.70E-01	2.75E-01	9.30E-01	7.60E-01	1.0				
173	570	0.0	0.0	9.52E-01	2.08E-01	9.40E-01	7.60E-01	1.0				
174	575	0.0	0.0	9.10E-01	1.70E-01	9.40E-01	7.50E-01	1.0				
175	580	0.0	0.0	8.70E-01	1.21E-01	9.30E-01	7.50E-01	1.0				
176	585	0.0	0.0	8.10E-01	1.00E-01	9.50E-01	7.40E-01	1.0				
177	590	0.0	0.0	7.57E-01	6.55E-01	9.50E-01	7.40E-01	1.00				
178	595	0.0	0.0	7.10E-01	5.30E-01	9.60E-01	7.30E-01	1.0				
179	600	0.0	0.0	6.31E-01	3.32E-01	9.60E-01	7.30E-01	1.0				
180	605	0.0	0.0	5.80E-01	2.35E-01	9.60E-01	7.20E-01	1.0				
181	610	0.0	0.0	5.03E-01	1.59E-02	9.60E-01	7.20E-01	1.0				
182	615	0.0	0.0	4.50E-01	1.10E-02	9.60E-01	7.10E-01	1.0				
183	620	0.0	0.0	3.81E-01	7.37E-03	9.60E-01	7.00E-01	1.0				
184	625	0.0	0.0	3.25E-01	4.30E-03	8.80E-01	6.90E-01	1.0				
185	630	0.0	0.0	2.65E-01	3.34E-03	8.80E-01	6.80E-01	1.0				
186	635	0.0	0.0	2.15E-01	2.10E-03	8.90E-01	6.70E-01	1.0				
187	640	0.0	0.0	1.75E-01	1.50E-03	9.60E-01	6.60E-01	1.0				
188	645	0.0	0.0	1.32E-01	9.00E-03	9.60E-01	6.50E-01	1.0				
189	650	0.0	0.0	1.07E-01	6.77E-04	9.60E-01	6.50E-01	1.0				
190	655	0.0	0.0	7.50E-02	4.50E-04	9.60E-01	6.30E-01	1.0				
191	660	0.0	0.0	6.10E-02	3.13E-04	9.60E-01	6.20E-01	1.0				
192	665	0.0	0.0	4.35E-02	2.25E-04	9.60E-01	6.10E-01	1.0				
193	670	0.0	0.0	3.20E-02	1.48E-04	9.60E-01	6.00E-01	1.0				
194	675	0.0	0.0	2.25E-02	1.15E-04	9.60E-01	5.90E-01	1.0				
195	680	0.0	0.0	1.70E-02	7.15E-05	9.60E-01	5.90E-01	1.0				
196	685	0.0	0.0	1.06E-02	5.35E-05	9.60E-01	5.90E-01	1.0				
197	690	0.0	0.0	8.20E-03	3.53E-05	9.60E-01	5.70E-01	1.0				
198	695	0.0	0.0	5.90E-03	2.50E-05	9.60E-01	5.60E-01	1.0				
199	700	0.0	0.0	4.10E-03	1.78E-05	9.60E-01	5.50E-01	1.0				
200	705	0.0	0.0	3.00E-03	1.25E-05	9.60E-01	5.40E-01	0.98				
201	710	0.0	0.0	2.10E-03	9.14E-06	9.60E-01	5.40E-01	0.95				
202	715	0.0	0.0	1.46E-03	7.00E-06	9.60E-01	5.30E-01	0.93				
203	720	0.0	0.0	1.05E-03	4.79E-06	9.60E-01	5.20E-01	0.91				
204	725	0.0	0.0	7.70E-04	3.74E-06	9.60E-01	5.10E-01	0.89				
205	730	0.0	0.0	5.20E-04	2.55E-06	9.60E-01	5.00E-01	0.87				
206	735	0.0	0.0	3.50E-04	2.00E-06	9.60E-01	5.00E-01	0.85				
207	740	0.0	0.0	2.50E-04	1.38E-06	9.60E-01	4.90E-01	0.83				
208	745	0.0	0.0	1.75E-04	1.10E-06	9.60E-01	4.80E-01	0.81				
209	750	0.0	0.0	1.20E-04	7.50E-07	9.60E-01	4.70E-01	0.79				
210	755	0.0	0.0	8.50E-05	5.50E-07	9.60E-01	4.60E-01	0.78				
211	760	0.0	0.0	6.00E-05	4.25E-07	9.60E-01	4.50E-01	0.76				
212	765	0.0	0.0	4.20E-05	3.14E-07	9.60E-01	4.40E-01	0.74				
213	770	0.0	0.0	3.00E-05	2.41E-07	9.60E-01	4.30E-01	0.72				
214	775	0.0	0.0	2.00E-05	1.75E-07	9.60E-01	4.20E-01	0.70				
215	780	0.0	0.0	1.50E-05	1.39E-07	9.60E-01	4.20E-01	0.68				
216	785	0.0	0.0	0.0	0.0	9.60E-01	4.00E-01	0.68				</

λ	S_λ	U_λ	V_λ	V'_λ	T_λ	$T \cdot A_{PE_\lambda}$	R_λ	A_λ	B_λ
232	865 0.0	0.0	0.0	0.0	9.60E-01	2.70E-01	0.47	0.0	1.00E-03
233	870 0.0	0.0	0.0	0.0	9.60E-01	2.70E-01	0.46	0.0	1.00E-03
234	875 0.0	0.0	0.0	0.0	9.60E-01	2.50E-01	0.45	0.0	1.00E-03
235	880 0.0	0.0	0.0	0.0	9.60E-01	2.60E-01	0.44	0.0	1.00E-03
236	885 0.0	0.0	0.0	0.0	9.60E-01	2.50E-01	0.43	0.0	1.00E-03
237	890 0.0	0.0	0.0	0.0	9.60E-01	2.50E-01	0.42	0.0	1.00E-03
238	895 0.0	0.0	0.0	0.0	9.50E-01	2.40E-01	0.41	0.0	1.00E-03
239	900 0.0	0.0	0.0	0.0	9.50E-01	2.40E-01	0.40	0.0	1.00E-03
240	905 0.0	0.0	0.0	0.0	9.40E-01	2.30E-01	0.39	0.0	1.00E-03
241	910 0.0	0.0	0.0	0.0	9.40E-01	2.30E-01	0.38	0.0	1.00E-03
242	915 0.0	0.0	0.0	0.0	9.30E-01	2.20E-01	0.37	0.0	1.00E-03
243	920 0.0	0.0	0.0	0.0	9.30E-01	2.20E-01	0.36	0.0	1.00E-03
244	925 0.0	0.0	0.0	0.0	9.20E-01	2.10E-01	0.35	0.0	1.00E-03
245	930 0.0	0.0	0.0	0.0	9.20E-01	2.10E-01	0.35	0.0	1.00E-03
246	935 0.0	0.0	0.0	0.0	9.10E-01	2.00E-01	0.34	0.0	1.00E-03
247	940 0.0	0.0	0.0	0.0	9.00E-01	1.90E-01	0.33	0.0	1.00E-03
248	945 0.0	0.0	0.0	0.0	8.80E-01	1.80E-01	0.32	0.0	1.00E-03
249	950 0.0	0.0	0.0	0.0	8.30E-01	1.70E-01	0.32	0.0	1.00E-03
250	955 0.0	0.0	0.0	0.0	7.80E-01	1.30E-01	0.31	0.0	1.00E-03
251	960 0.0	0.0	0.0	0.0	7.00E-01	1.10E-01	0.30	0.0	1.00E-03
252	965 0.0	0.0	0.0	0.0	6.20E-01	9.50E-02	0.30	0.0	1.00E-03
253	970 0.0	0.0	0.0	0.0	5.40E-01	7.50E-02	0.29	0.0	1.00E-03
254	975 0.0	0.0	0.0	0.0	5.20E-01	7.70E-02	0.28	0.0	1.00E-03
255	980 0.0	0.0	0.0	0.0	5.00E-01	7.80E-02	0.28	0.0	1.00E-03
256	985 0.0	0.0	0.0	0.0	4.80E-01	8.20E-02	0.27	0.0	1.00E-03
257	990 0.0	0.0	0.0	0.0	4.50E-01	8.50E-02	0.26	0.0	1.00E-03
258	995 0.0	0.0	0.0	0.0	4.30E-01	9.00E-02	0.26	0.0	1.00E-03
259	1000 0.0	0.0	0.0	0.0	4.20E-01	9.20E-02	0.25	0.0	1.00E-03
260	1005 0.0	0.0	0.0	0.0	4.10E-01	9.30E-02	0.25	0.0	1.00E-03
261	1010 0.0	0.0	0.0	0.0	4.10E-01	9.50E-02	0.24	0.0	1.00E-03
262	1015 0.0	0.0	0.0	0.0	4.20E-01	9.50E-02	0.23	0.0	1.00E-03
263	1020 0.0	0.0	0.0	0.0	4.20E-01	9.70E-02	0.22	0.0	1.00E-03
264	1025 0.0	0.0	0.0	0.0	4.30E-01	9.70E-02	0.22	0.0	1.00E-03
265	1030 0.0	0.0	0.0	0.0	4.50E-01	1.00E-01	0.22	0.0	1.00E-03
266	1035 0.0	0.0	0.0	0.0	4.60E-01	1.00E-01	0.21	0.0	1.00E-03
267	1040 0.0	0.0	0.0	0.0	4.80E-01	1.00E-01	0.21	0.0	1.00E-03
268	1045 0.0	0.0	0.0	0.0	5.20E-01	1.00E-01	0.20	0.0	1.00E-03
269	1050 0.0	0.0	0.0	0.0	5.60E-01	1.10E-01	0.20	0.0	1.00E-03
270	1055 0.0	0.0	0.0	0.0	6.00E-01	1.10E-01	0.20	0.0	1.00E-03
271	1060 0.0	0.0	0.0	0.0	6.40E-01	1.20E-01	0.20	0.0	1.00E-03
272	1065 0.0	0.0	0.0	0.0	6.70E-01	1.20E-01	0.20	0.0	1.00E-03
273	1070 0.0	0.0	0.0	0.0	6.90E-01	1.30E-01	0.20	0.0	1.00E-03
274	1075 0.0	0.0	0.0	0.0	7.10E-01	1.30E-01	0.20	0.0	1.00E-03
275	1080 0.0	0.0	0.0	0.0	7.30E-01	1.30E-01	0.20	0.0	1.00E-03
276	1085 0.0	0.0	0.0	0.0	7.50E-01	1.30E-01	0.20	0.0	1.00E-03
277	1090 0.0	0.0	0.0	0.0	7.60E-01	1.40E-01	0.20	0.0	1.00E-03
278	1095 0.0	0.0	0.0	0.0	7.70E-01	1.40E-01	0.20	0.0	1.00E-03
279	1100 0.0	0.0	0.0	0.0	7.80E-01	1.40E-01	0.20	0.0	1.00E-03
280	1105 0.0	0.0	0.0	0.0	7.80E-01	1.40E-01	0.20	0.0	1.00E-03
281	1110 0.0	0.0	0.0	0.0	7.90E-01	1.40E-01	0.20	0.0	1.00E-03
282	1115 0.0	0.0	0.0	0.0	7.90E-01	1.40E-01	0.20	0.0	1.00E-03
283	1120 0.0	0.0	0.0	0.0	7.90E-01	1.30E-01	0.20	0.0	1.00E-03
284	1125 0.0	0.0	0.0	0.0	7.80E-01	1.30E-01	0.20	0.0	1.00E-03
285	1130 0.0	0.0	0.0	0.0	7.70E-01	1.30E-01	0.20	0.0	1.00E-03
286	1135 0.0	0.0	0.0	0.0	7.60E-01	1.20E-01	0.20	0.0	1.00E-03
287	1140 0.0	0.0	0.0	0.0	7.50E-01	1.20E-01	0.20	0.0	1.00E-03
288	1145 0.0	0.0	0.0	0.0	7.20E-01	1.10E-01	0.20	0.0	1.00E-03
289	1150 0.0	0.0	0.0	0.0	6.90E-01	1.00E-01	0.20	0.0	1.00E-03
290	1155 0.0	0.0	0.0	0.0	6.00E-01	6.20E-02	0.20	0.0	1.00E-03
291	1160 0.0	0.0	0.0	0.0	5.00E-01	5.00E-02	0.20	0.0	1.00E-03
292	1165 0.0	0.0	0.0	0.0	3.90E-01	2.50E-02	0.20	0.0	1.00E-03
293	1170 0.0	0.0	0.0	0.0	2.60E-01	1.50E-02	0.20	0.0	1.00E-03
294	1175 0.0	0.0	0.0	0.0	2.30E-01	1.10E-02	0.20	0.0	1.00E-03
295	1180 0.0	0.0	0.0	0.0	1.80E-01	1.00E-02	0.20	0.0	1.00E-03
296	1185 0.0	0.0	0.0	0.0	1.50E-01	1.20E-02	0.20	0.0	1.00E-03
297	1190 0.0	0.0	0.0	0.0	1.20E-01	1.30E-02	0.20	0.0	1.00E-03
298	1195 0.0	0.0	0.0	0.0	1.10E-01	1.40E-02	0.20	0.0	1.00E-03
299	1200 0.0	0.0	0.0	0.0	1.00E-01	1.50E-02	0.20	0.0	1.00E-03
300	1205 0.0	0.0	0.0	0.0	9.00E-02	1.50E-02	0.20	0.0	1.00E-03
301	1210 0.0	0.0	0.0	0.0	8.00E-02	1.50E-02	0.20	0.0	1.00E-03
302	1215 0.0	0.0	0.0	0.0	7.30E-02	1.50E-02	0.20	0.0	1.00E-03
303	1220 0.0	0.0	0.0	0.0	6.50E-02	1.50E-02	0.20	0.0	1.00E-03
304	1225 0.0	0.0	0.0	0.0	6.00E-02	1.50E-02	0.20	0.0	1.00E-03
305	1230 0.0	0.0	0.0	0.0	5.50E-02	1.50E-02	0.20	0.0	1.00E-03
306	1235 0.0	0.0	0.0	0.0	5.30E-02	1.50E-02	0.20	0.0	1.00E-03
307	1240 0.0	0.0	0.0	0.0	5.20E-02	1.50E-02	0.20	0.0	1.00E-03
308	1245 0.0	0.0	0.0	0.0	5.60E-02	1.50E-02	0.20	0.0	1.00E-03
309	1250 0.0	0.0	0.0	0.0	6.00E-02	1.50E-02	0.20	0.0	1.00E-03
310	1255 0.0	0.0	0.0	0.0	6.30E-02	1.60E-02	0.20	0.0	1.00E-03
311	1260 0.0	0.0	0.0	0.0	6.50E-02	1.70E-02	0.20	0.0	1.00E-03
312	1265 0.0	0.0	0.0	0.0	6.80E-02	1.70E-02	0.20	0.0	1.00E-03
313	1270 0.0	0.0	0.0	0.0	7.20E-02	1.80E-02	0.20	0.0	1.00E-03
314	1275 0.0	0.0	0.0	0.0	7.70E-02	1.80E-02	0.20	0.0	1.00E-03
315	1280 0.0	0.0	0.0	0.0	6.20E-02	1.80E-02	0.20	0.0	1.00E-03
316	1285 0.0	0.0	0.0	0.0	8.60E-02	1.80E-02	0.20	0.0	1.00E-03
317	1290 0.0	0.0	0.0	0.0	9.00E-02	1.90E-02	0.20	0.0	1.00E-03
318	1295 0.0	0.0	0.0	0.0	9.50E-02	2.00E-02	0.20	0.0	1.00E-03
319	1300 0.0	0.0	0.0	0.0	1.00E-01	2.00E-02	0.20	0.0	1.00E-03
320	1305 0.0	0.0	0.0	0.0	9.80E-02	1.80E-02	0.20	0.0	1.00E-03
321	1310 0.0	0.0	0.0	0.0	9.50E-02	1.65E-02	0.20	0.0	1.00E-03
322	1315 0.0	0.0	0.0	0.0	9.00E-02	1.20E-02	0.20	0.0	1.00E-03
323	1320 0.0	0.0	0.0	0.0	8.50E-02	1.00E-02	0.20	0.0	1.00E-03
324	1325 0.0	0.0	0.0	0.0	7.00E-02	8.50E-03	0.20	0.0	1.00E-03
325	1330 0.0	0.0	0.0	0.0	6.50E-02	8.00E-03	0.20	0.0	1.00E-03
326	1335 0.0	0.0	0.0	0.0	5.90E-02	5.00E-03	0.20	0.0	1.00E-03
327	1340 0.0	0.0	0.0	0.0	5.20E-02	4.00E-03	0.20	0.0	1.00E-03
328	1345 0.0	0.0	0.0	0.0	4.50E-02	2.50E-03	0.20	0.0	1.00E-03
329	1350 0.0	0.0	0.0	0.0	4.00E-02	2.00E-03	0.20	0.0	1.00E-03
330	1355 0.0	0.0	0.0	0.0	3.30E-02	1.20E-03	0.20	0.0	1.00E-03
331	1360 0.0	0.0	0.0	0.0	2.50E-02	1.00E-03	0.20	0.0	1.00E-03
332	1365 0.0	0.0	0.0	0.0	2.00E-02	7.00E-04	0.20	0.0	1.00E-03
333	1370 0.0	0.0	0.0	0.0	1.50E-02	0.0	0.20	0.0	1.00E-03
334	1375 0.0	0.0	0.0	0.0	1.30E-02	0.0	0.20	0.0	1.00E-03
335	1380 0.0	0.0	0.0	0.0	1.00E-02	0.0	0.20	0.0	1.00E-03
336	1385 0.0	0.0	0.0	0.0	8.				



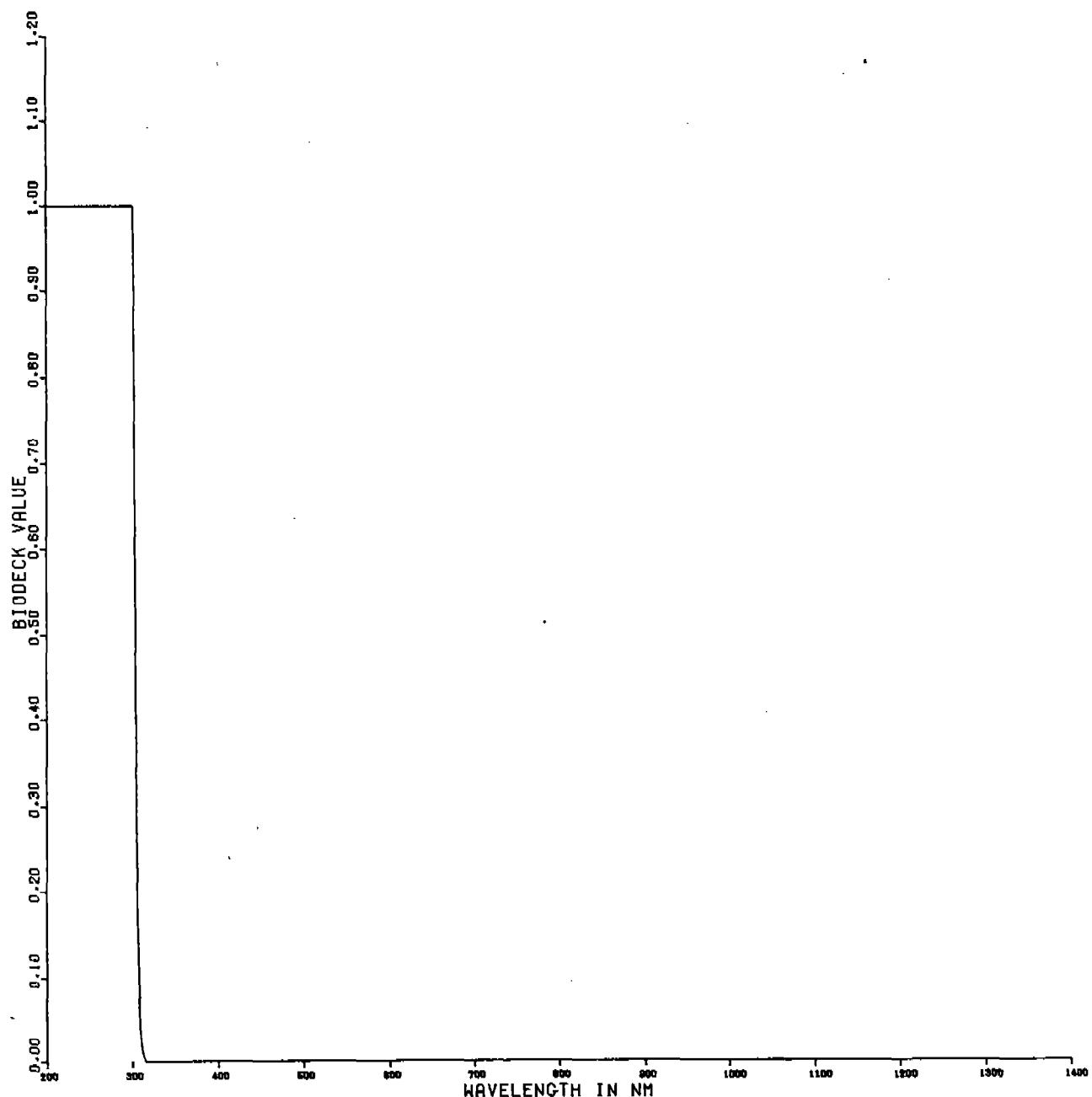
S-LAMBDA

FIGURE B-1. ULTRAVIOLET ACTION SPECTRUM ACCORDING TO THE AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)



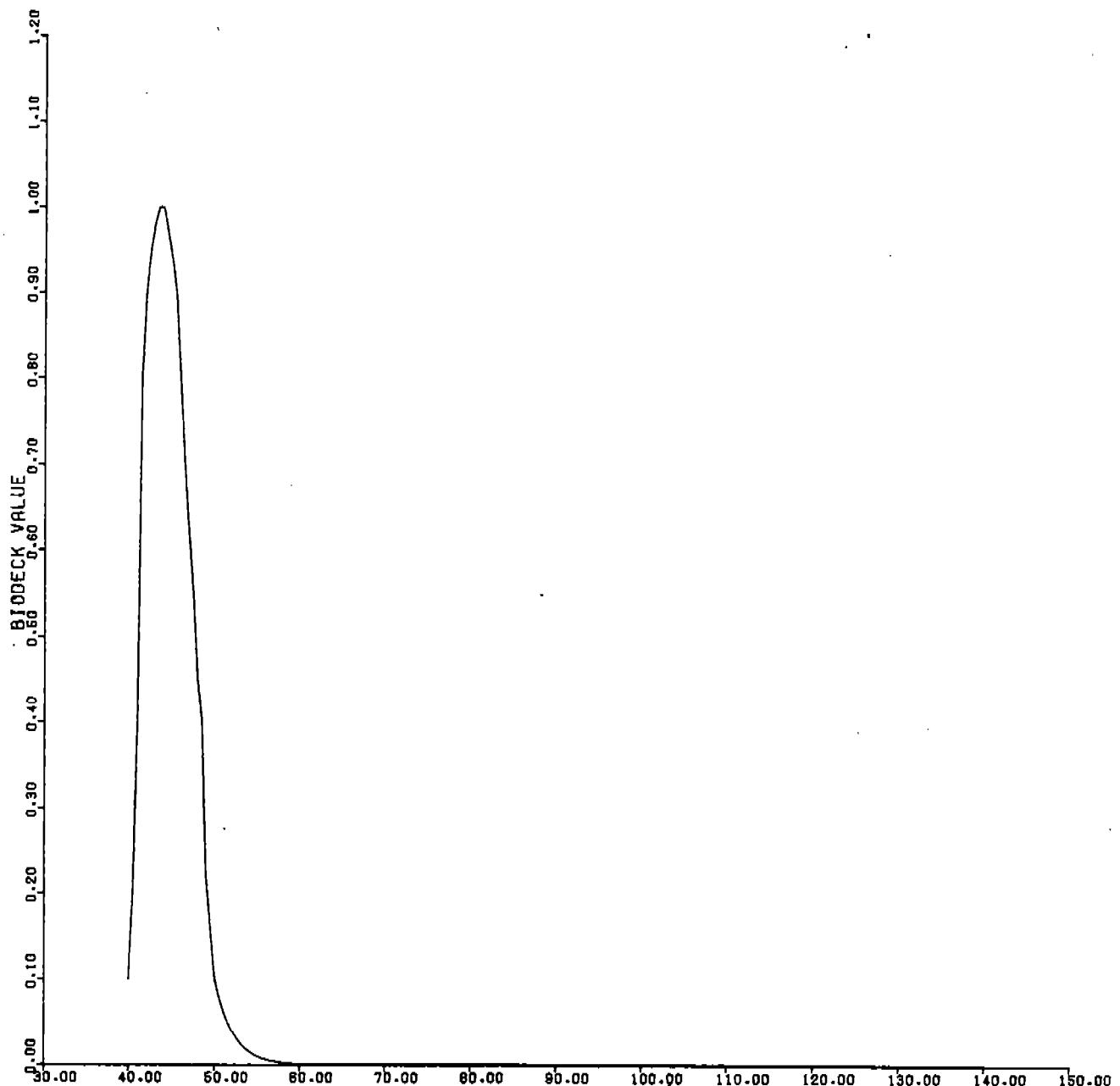
U-LAMBDA

FIGURE B-2. ULTRAVIOLET ACTION SPECTRUM ACCORDING TO COMMISSION INTERNATIONALE de l' ECLAIRAGE
(CIE)



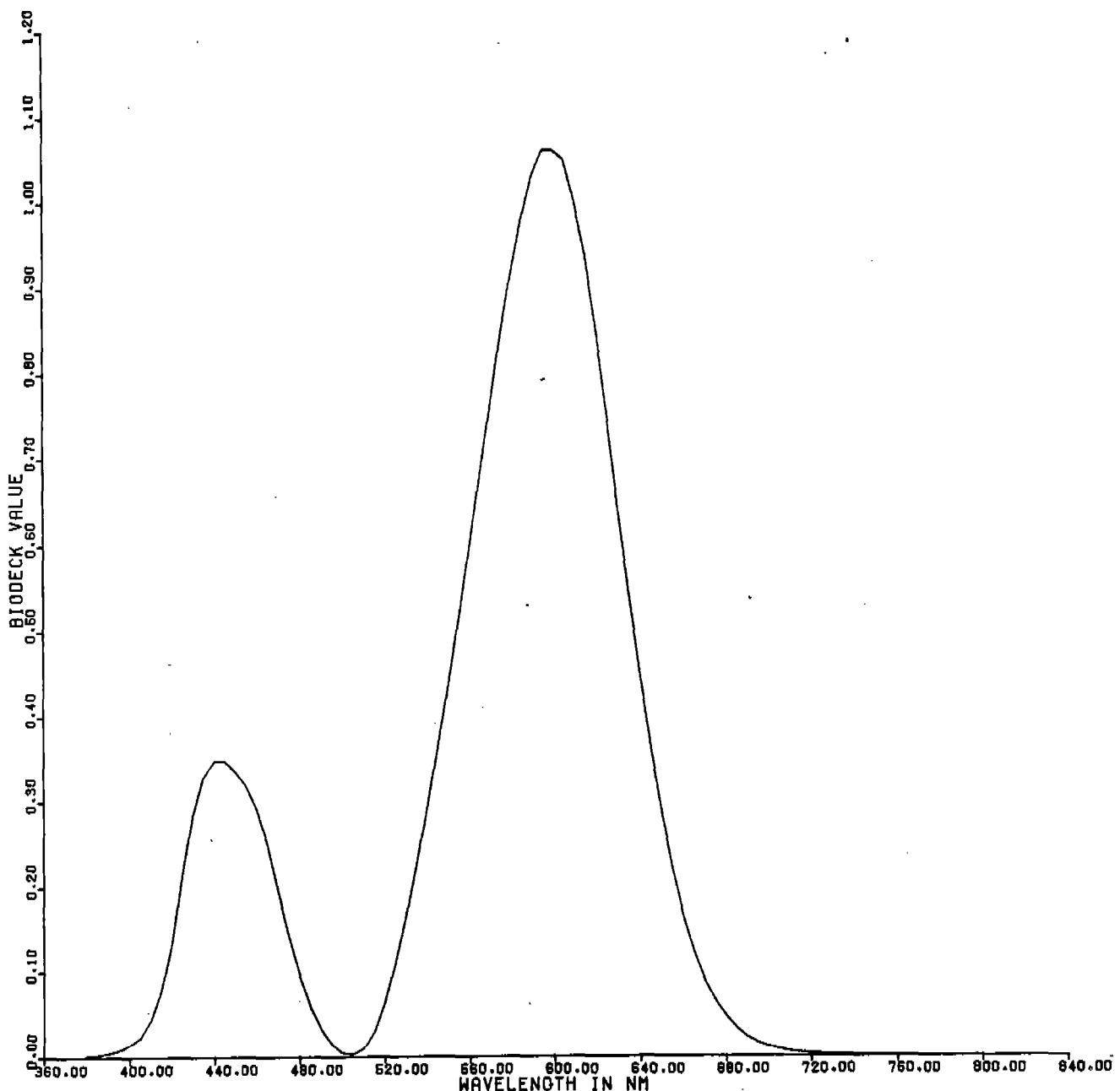
A-LAMBDA

FIGURE B-3. ULTRAVIOLET ACTION SPECTR ACCORDING TO ANSI Z136 LASER PROTECTION STANDARDS



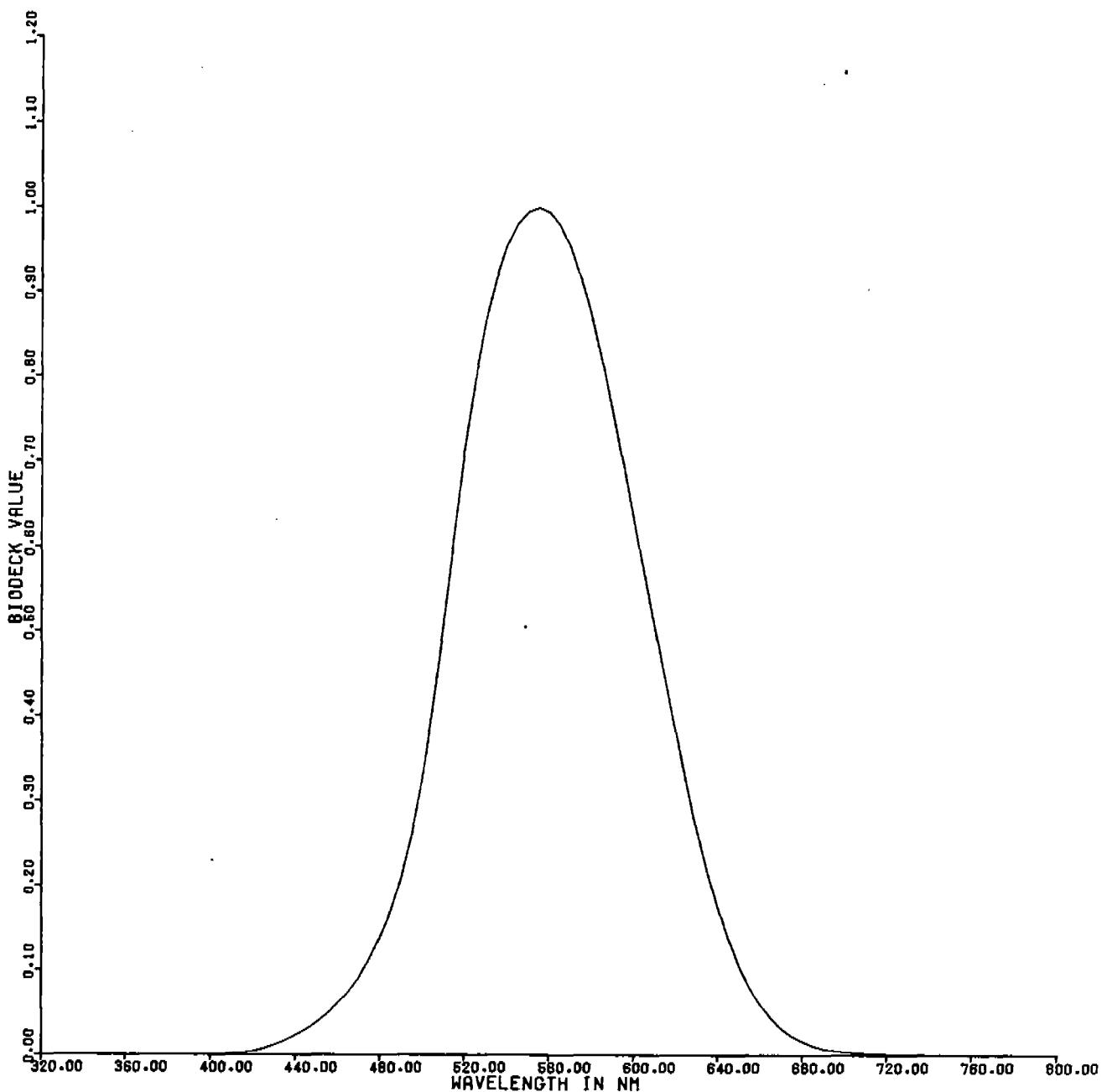
BLUE HAZARD

FIGURE B-4. BLUE LIGHT HAZARD FUNCTION



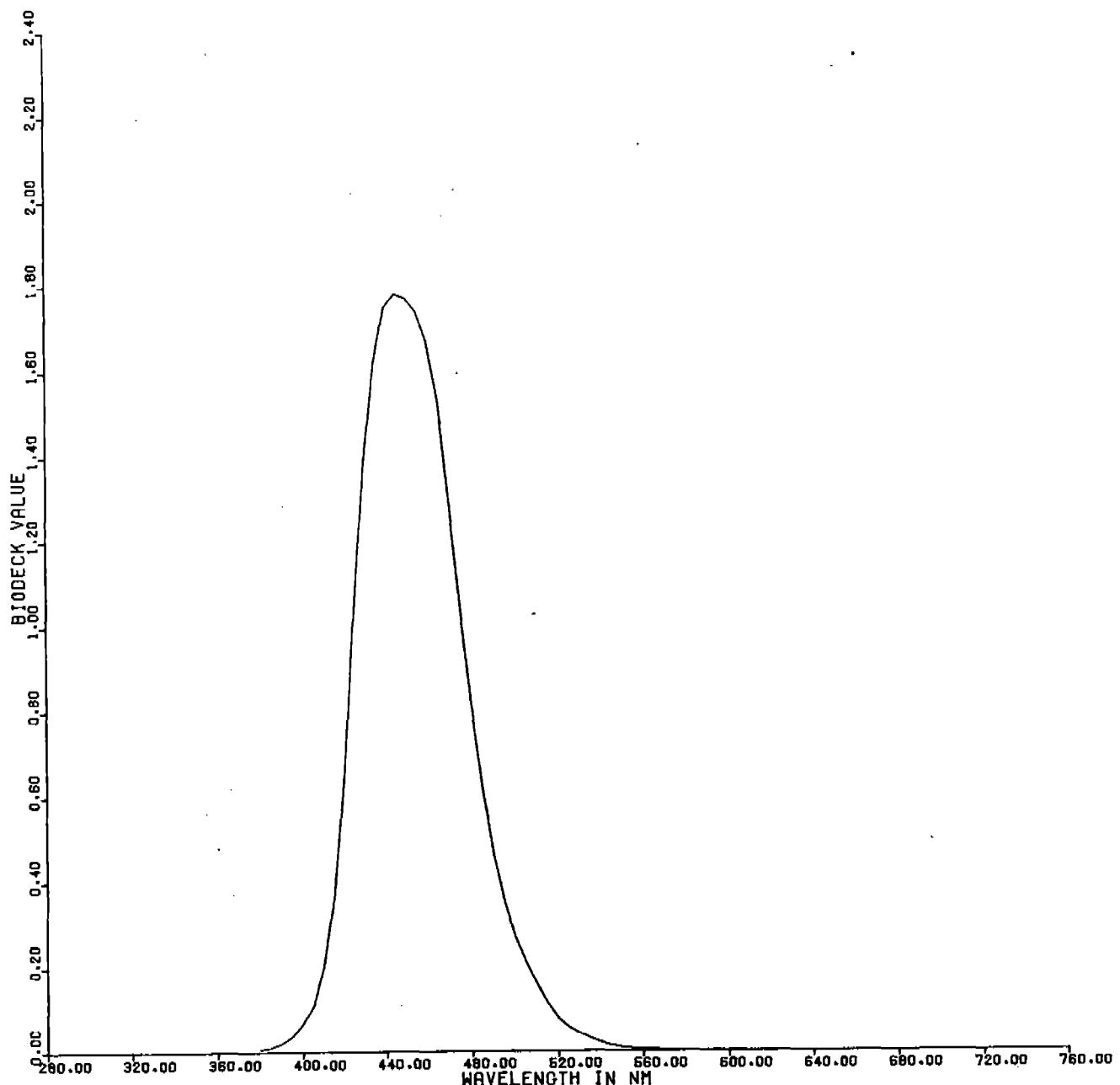
X-BAR DATA

FIGURE B-5. SPECTRAL TRISTIMULUS VALUES FOR EQUAL-ENERGY SOURCE, X-COORDINATE



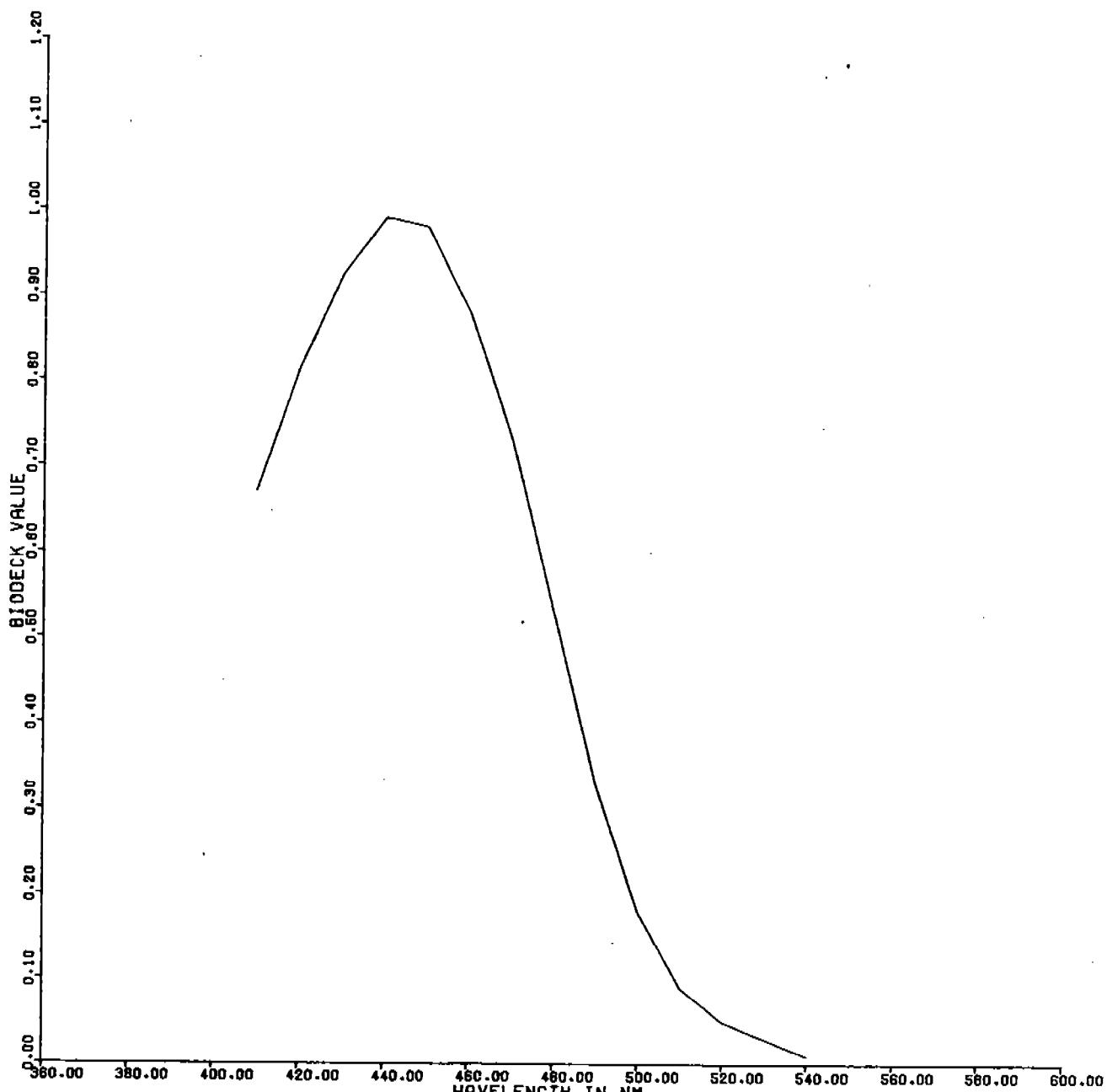
Y-BAR DATA

FIGURE B-6. SPECTRAL TRISTIMULUS VALUES FOR EQUAL-ENERGY SOURCE, Y-COORDINATE



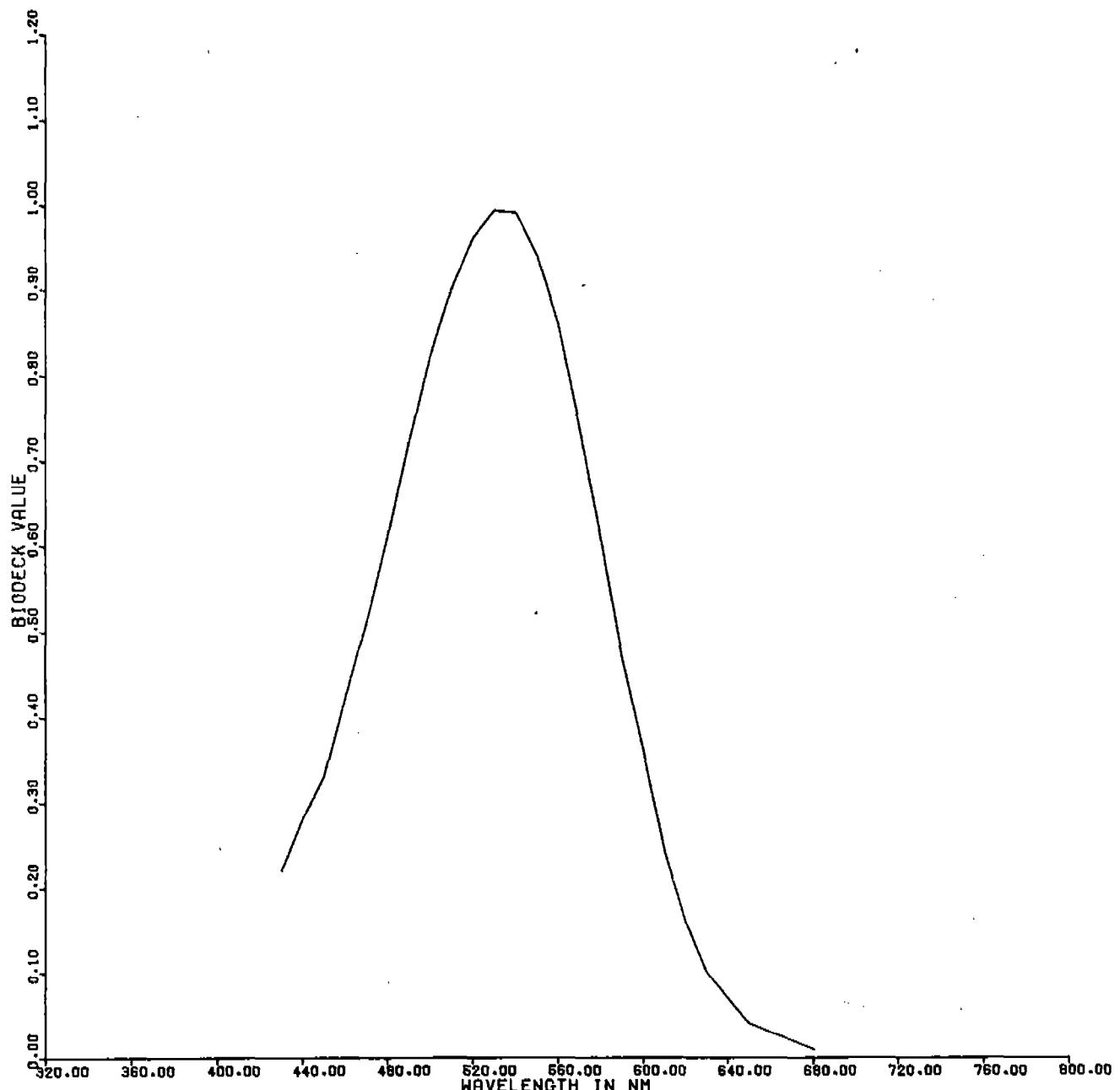
Z-BAR DATA

FIGURE B-7. SPECTRAL TRISTIMULUS VALUES FOR EQUAL-ENERGY SOURCE, Z-COORDINATE



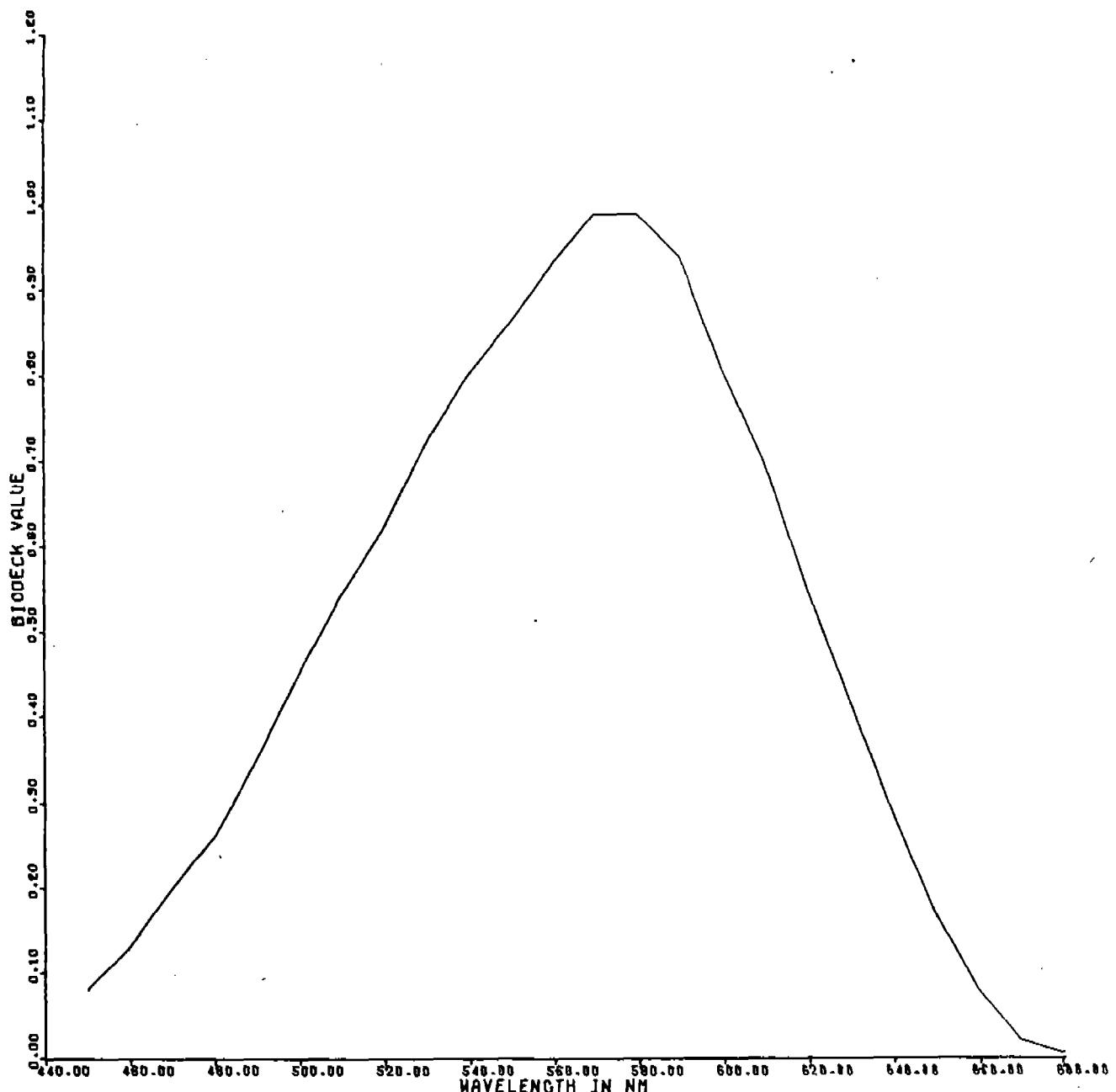
P445 DATA

FIGURE B-8. SPECTRAL DISTRIBUTION COEFFICIENTS FOR DARTNELL NOMOGRAM P-445 COORDINATE



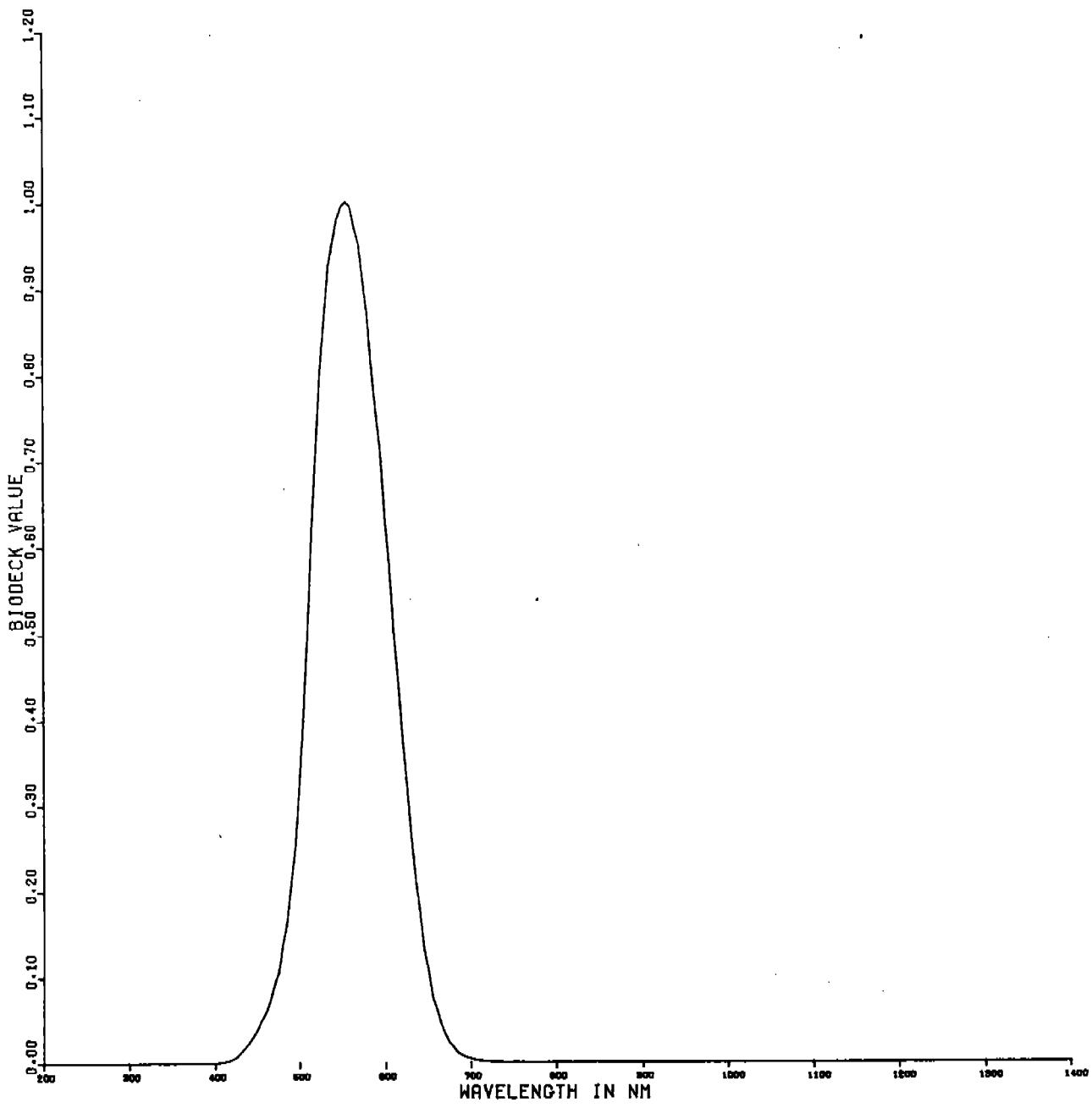
P535 DATA

FIGURE B-9. SPECTRAL DISTRIBUTION COEFFICIENTS FOR DARTNELL NOMOGRAPH P-535 COORDINATE



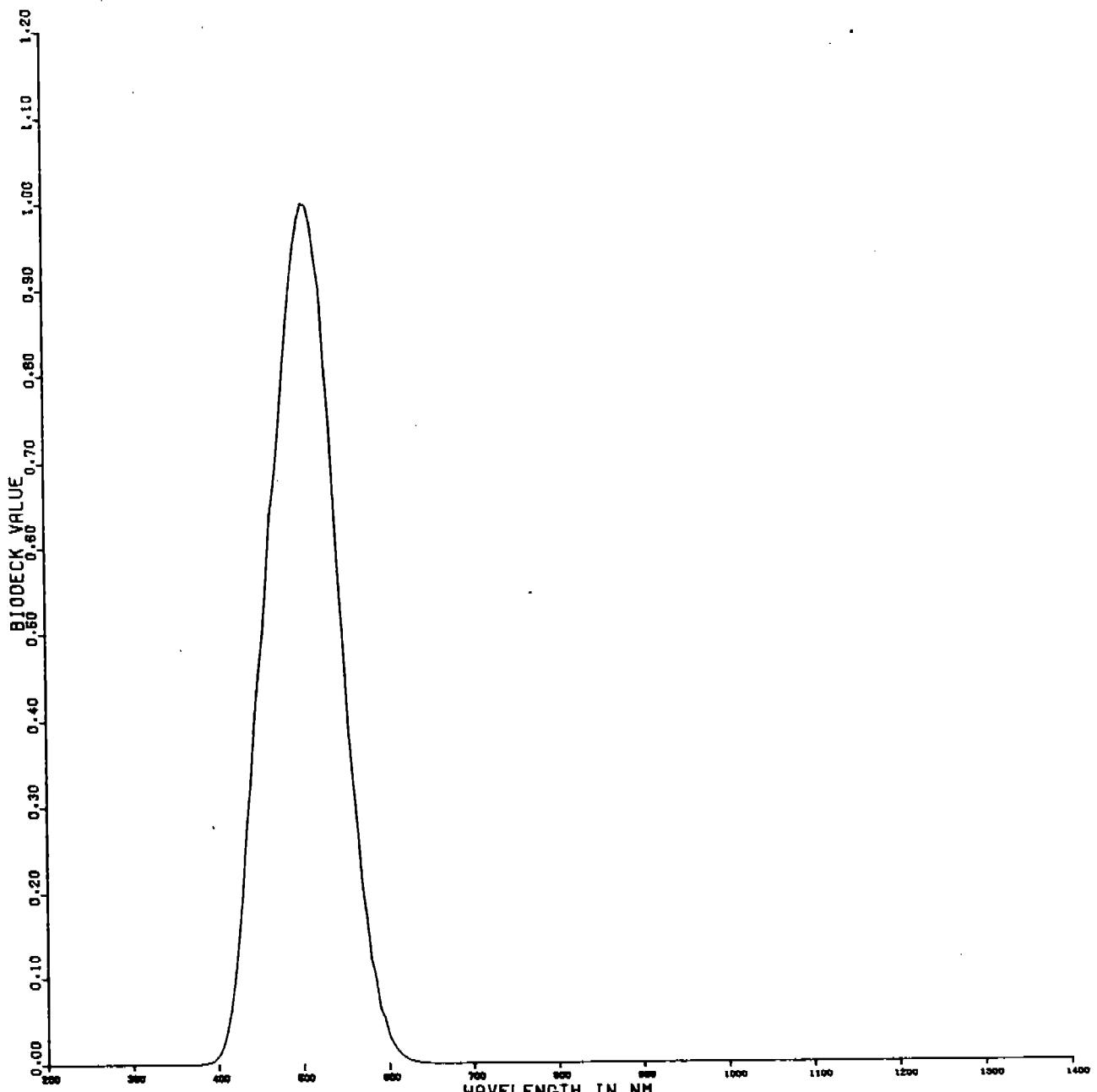
P575 DATA

FIGURE B-10. SPECTRAL DISTRIBUTION COEFFICIENTS FOR DARTNELL NOMOGRAM P-575 COORDINATE



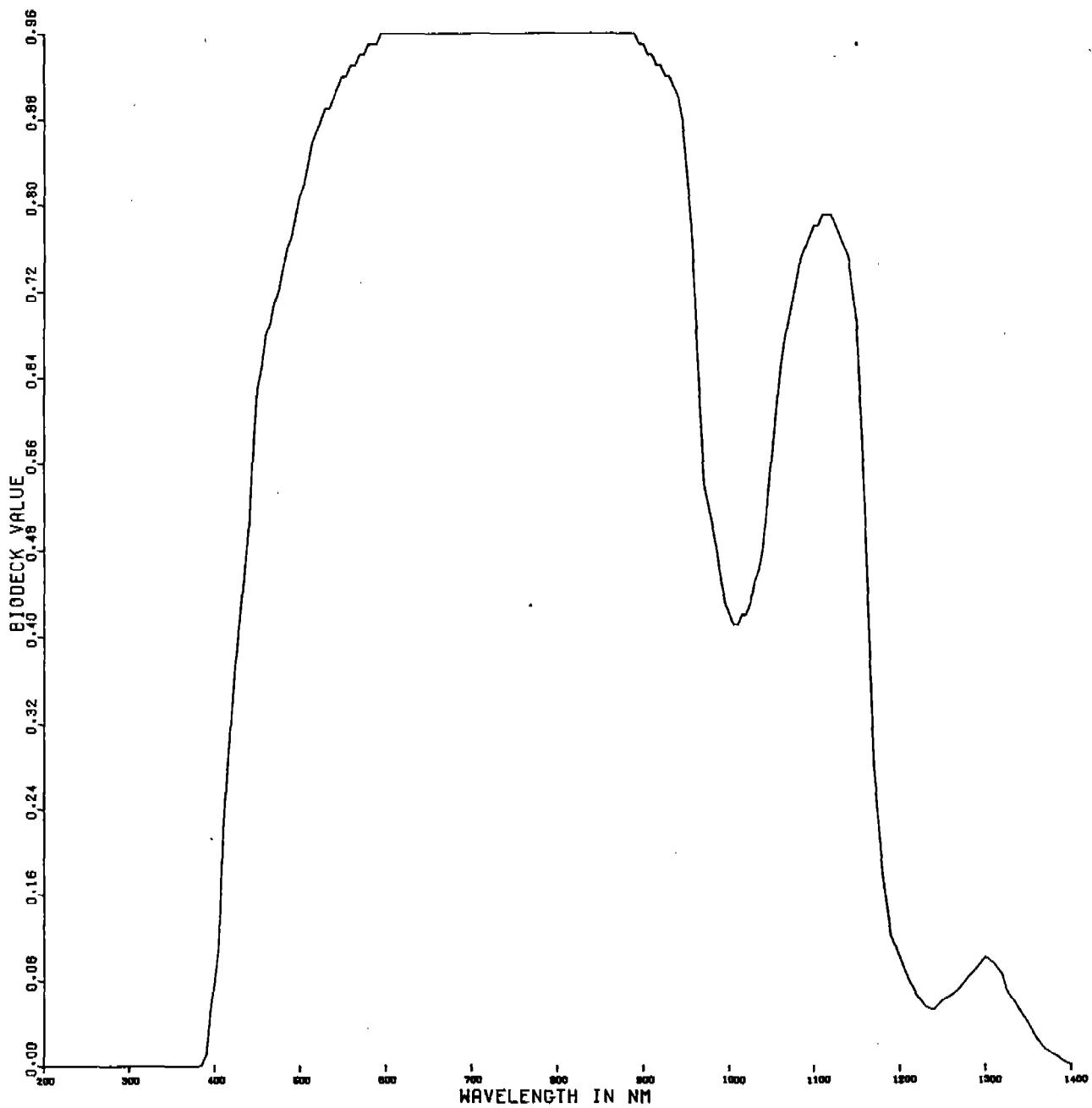
V-LAMBDA

FIGURE B-11. PHOTOPIC VISUAL RESPONSE OF THE HUMAN EYE



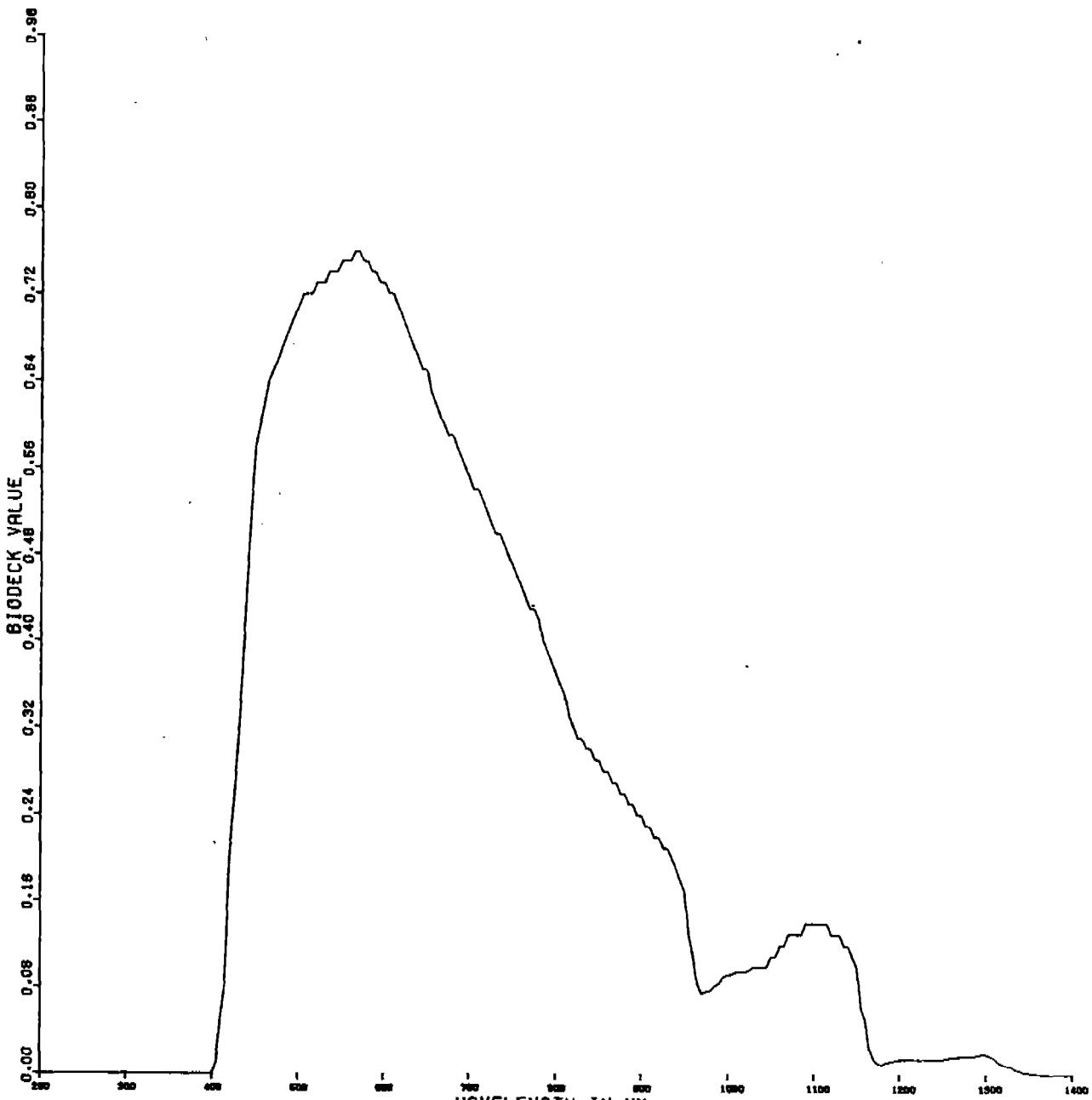
V* - LAMBDA

FIGURE B-12. SCOTOPIC VISUAL RESPONSE OF THE HUMAN EYE



T-LAMBDA

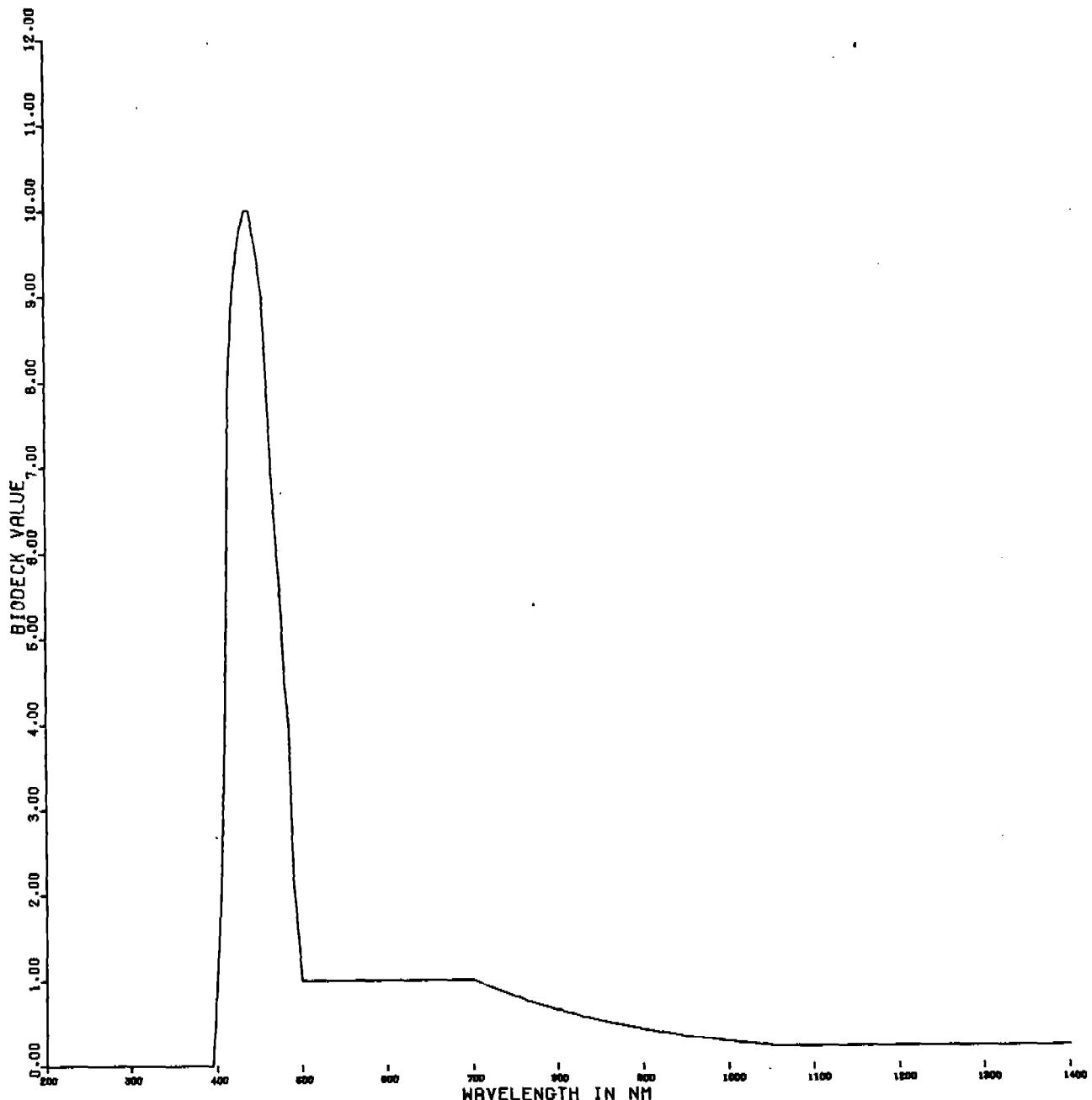
FIGURE B-13. SPECTRAL TRANSMISSION OF THE HUMAN EYE



T-A-LAMBDA

FIGURE B-14. SPECTRAL TRANSMISSION OF THE HUMAN EYE MULTIPLIED BY THE ABSORPTION IN THE RETINA

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources



R-LAMBDA

FIGURE B-15. RETINAL BURN HAZARD FUNCTION ACCORDING TO ACGIH, 1979

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

APPENDIX C
OPERATING INSTRUCTIONS

1. GENERAL.

a. Getting Started. To run the Laser Microwave Division spectral weighting program, each deck must be keypunched and placed in the proper order to be read into the computer terminal. These decks are illustrated graphically in Figure A-2. Special Forms are provided for the routine submission of data to the computer center. No forms are available for data which need to be punched only once. The runstream deck, the biodeck, and the plot deck fit into this category.

b. Runstream Deck. The runstream deck is composed of the first 12 to 14 cards in Figure A-1. If a Univac 1108 Computer is used, the cards may be submitted exactly as written. Otherwise, normal control cards should be used to set up two files for use by the plot routine and one file for data storage. All data are written onto file 15. File 20 is a buffer. The file RK\$LMDSW2 contains the FORTRAN program. If the program is not on file, it should be inserted before the @XQT card. The file LM\$LMDSWP contains the biodeck data. If these data are not on file, the data should be inserted in place of the @ADD LM\$LMDSWP.DATA card.

c. Biodeck Data. This information is not stored exactly as it appears in the Table, Appendix B. Figures B-1 through B-15, graphically illustrate these functions. The first nine columns of data are stored with the format (F4.0,8E9.2). The remaining functions are read into the computer individually by wavelength and specific function with the format (F4.0,T9,E9.2). Only nonzero values need to be read-in. The functions are entered in the same order in which they appear in the Table by the subroutine BDREAD. An "END" card must be placed at the end of each function. No header cards are used with biodata.

d. FORTRAN Program. A listing of the FORTRAN V program is provided in Appendix B. Some modifications will be necessary if a computer other than a Univac 1108 is used.

2. CODING FORMS.

a. Cover Sheet. These data are used to identify the information for future reference and determine the kinds of input data to the Data Processing personnel. HSE-RL Form 90 should be used for this purpose (see Figure C-1). Item-by-item instructions are given below.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

COVER SHEET												FOR INSTRUCTIONS SEE REVERSE																													
A. REQUESTOR'S NAME																																									
B. PROJECT DESCRIPTION (DESCRP)																																									
C. FILTER ONE (ELEMENT NAME)							D. FILTER TWO (ELEMENT NAME)																																		
E. FILTER THREE (ELEMENT NAME)							F. INPUT DECK TO BE STORED																																		
G. CALCULATION CONTROL CARD																																									
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>														1	2	3	4	5	6	7	8	9	10	11	12	13	14														
1	2	3	4	5	6	7	8	9	10	11	12	13	14																												
H. DISTANCE FACTOR CARD																																									
DFU (1.0)		DFV (1.0)		BANPAS (1) (1.0)		BWA1 (400)		BANPAS (2) (50)		BWA2 (700)		BANPAS (3) (10.0)																													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28														
I. CALIBRATION DECK																																									
SUPPLIED				ELEMENT NAME				NONE																																	
J. BIODECK CARD -- @ADD LM\$LMDSWP.DAT																																									
SOURCES																																									
K. ELEMENT NAME							L. BLACKBODY TEMPERATURE																																		
M. CHECKLIST		<input type="checkbox"/> SOURCE DESCRIPTION		<input type="checkbox"/> CALCULATION CONTROL CARD		<input type="checkbox"/> CALIBRATION DECK																																			
		<input type="checkbox"/> HEADER CARDS		<input type="checkbox"/> INSTRUMENT READINGS		<input type="checkbox"/> SOLID ANGLE																																			
		<input type="checkbox"/> END CARDS		<input type="checkbox"/> DISTANCE FACTOR CARD		<input type="checkbox"/> ELEMENT NAMES																																			

HSE-RL Form 90, 1 Aug 81 Replaces USAEHA Form 90, 1 Jun 80

FIGURE C-1. Cover Sheet

HSE-RL/WP
Hazard Analysis of Broad-Band Optical Sources

INSTRUCTIONS

- A. Requestor's name. (Your Name)
- B. Project description. One or Two punched cards of free formated information. Include the name of the light source, manufacturer, source of the information and any other pertinent data.
- C. Filter One Element Name. Provide the element name of the filter if it is stored in the File, LM\$LMDSWP. Otherwise leave blank.
- D. Filter Two Element Name. Same as C.
- E. Filter Three Element Name. Same as C.
- F. Input deck to be stored. One deck may be stored in File LM\$LMDSWP. at the end of the run. Provide the name of the element and enter the type of deck in item G.
- G. Calculation Control Card.
Box Number:
 - 1. Number of Filters to be Processed (NUMFIL). -- Enter Number (maximum of three).
 - 2. Number of Columns for Filter 1 (NOCOF1).
 - 3. Number of Columns for Filter 2 (NOCOF2).
 - 4. Number of Columns for Filter 3 (NOCOF3).
 - 5. Form of Calibration Deck (CALDAT):
 - a. None Required -- Enter "2"
 - b. Uncomputed: One Deck -- Enter "0" Two Decks -- Enter "3" Three Decks -- Enter "5"
 - c. Computed: One Deck -- Enter "1" Two Decks -- Enter "4" Three Decks -- Enter "6"
 - 6-7. Specific Biological Function to be Listed Spectrally (GENWEI).
 - a. None --,00 e. T_λ --- 04 f. V_λ' --- 08 m. Z_λ --- 12 q. FT1 -- 16 u. L_e ---- 20
 - b. S_λ ---- 01 f. T-A --- 05 j. B_λ --- 09 n. P_{445} - 13 r. FT2 -- 17 v. L_b ---- 21
 - c. U_λ ---- 02 g. R_λ ---- 06 k. \bar{X}_λ --- 10 o. P_{535} - 14 s. Both - 18 w. CF ---- 22
 - d. A_λ ---- 03 h. V_λ ---- 07 l. \bar{V}_λ --- 11 p. P_{575} - 15 t. FT3 - 19
 - 8. General Function Used (GENFUN)? -- "1" is yes, zero or blank is no.
 - 9. GENWEI Plotted (PLPLOT)? -- "1" is yes, zero or blank is no.
 - 10. Input Deck to be stored on File (STORE):
 - a. None ----- 0 c. Filter One ----- 1 e. Filter Two ----- 2 g. Filter Three --- 3
 - b. Event ----- 4 d. Calibration ----- 5 f. Standard Lamp --- 6
 - 11. Spectral Irradiance Interpolated (IOS)? -- "1" is yes, zero or blank is no.
 - 12. Spectral Irradiance Plot inhibited (SUPRES)? -- "1" is yes, zero or blank is no.
 - 13. Linear or Log Scales for Plots (LINLOG)? a. Both--Enter "0" b. Linear--Enter "1"
 - c. Log--Enter "2"
 - 14. Summary Pages Only -- No Spectral Table (SUMRY)? -- "1" is yes, zero or blank is no.
 - H. Distance Factor Card.
 - 1. DFU. Ultraviolet Distance Factor to adjust the calibration factor when the instrument is calibrated at a distance different than specified on the standard lamp. Use the following formula: $DFU = \frac{(Distance\ Used)}{(Distance\ Specified)}^2$
 - 2. DFV. Visible Distance Factor to adjust the calibration factors when the instrument is calibrated at a distance other than specified in the standard lamp. Use the following formula: $DFV = \frac{(Distance\ Used)}{(Distance\ Specified)}^2$
 - 3. BANPAS (1). Bandpass of instrument in ultraviolet portion of spectrum in nanometers.
 - 4. BWAV1. Separating wavelength between ultraviolet and visible data collecting instruments. This value also determines calibration factor, which will be used if multiple calibration decks are used.
 - 5. BANPAS (2). Bandpass of instrument in visible portion of spectrum in nanometers.
 - 6. BWAV2. Separating wavelength between visible and near infrared data collecting instruments. This value also specifies which calibration factor is used when multiple calibration decks are used.
 - 7. BANPAS (3). Bandpass of instrument in near infrared portion of spectrum in nanometers.
 - I. Calibration Deck. The calibration may be either supplied with the data, retrieved from the File LM\$LMDSWP. or not used if the data readings are supplied as absolute spectral irradiance.
 - J. Biodeck Card. All biological data needed is stored in File LM\$LMDSWP.
 - K. Checklist. Be sure all pertinent data is provided for a successful run.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

(1) Requestor's Name. Fill in name of person who will answer all questions about the coding forms for this run.

(2) Project Description - DESCRP. Briefly give source description and/or project name (20 words or less). One or two cards must be punched. Adequately describe source for future reference.

(3) Calibration Deck Use. List name of calibration deck. This deck may be on file with the computer center or the calibration factors may be submitted with the rest of the forms. The first card of the calibration deck is an identification card. A unique number should be assigned to each calibration deck.

(4) Calculation Control Card.

(a) Column One. Enter number of filters to be weighted against source spectrum and evaluated by computer. These filters do not refer to order-blocking filters or narrow-pass filters used in gathering the spectral data for the source. The maximum number of filters which may be evaluated in one run is three. This column may be left blank when no filters are used.

(b) Columns Two, Three, and Four. These columns refer to how the filter data may be submitted. The normal manner would be to submit a deck by wavelength and fraction transmission. Either a "1" or a blank may be entered in column 2 for filter 1, column 3 for filter 2, or column 4 for filter 3, if this is the manner in which the data are submitted. Another way in which data may be submitted is to give both the readings with the filter and without the filter from an arbitrary light source. The computer will then divide the first value by the second to obtain transmission values. If the data are submitted in this manner, a "2" must be entered in columns 2, 3, or 4 for filter 1, 2, or 3, respectively.

(c) Column Five. This column determines the form of the calibration deck. The calibration deck should be reasonably complete and provide values for all instrument readings. If the calibration deck terminates before the end of the spectral data values, the source spectrum will be terminated at the end of the calibration deck. Likewise, all spectral data before the start of the calibration deck will be set at zero. The calibration deck may be submitted in seven manners as described in paragraph 2c, this Appendix.

(d) Columns Six and Seven. One of the specific biological functions or filter transmission may be weighted spectrally against the source spectrum and listed on the computer output. The proper value of GENWEI must be specified as listed below and punched in Columns 6 and 7.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

00 -- None
01 -- S -- Ultraviolet Irradiance According to ACGIH Action Spectra
02 -- U -- Ultraviolet Irradiance According to CIE Action Spectra
03 -- A -- Ultraviolet Irradiance According to ANSI Action Spectra
04 -- T -- Transmission of the Ocular Media x E
05 -- T·A -- Transmission of the Ocular Media x Absorption of Retina x E
06 -- R -- ACGIH Burn Hazard Function x E
07 -- V -- Photopic Spectral Luminous Efficiency x E
08 -- V' -- Scotopic Spectral Luminous Efficiency x E
09 -- B -- Blue Light Hazard Function x E
10 -- X -- Spectral Tristimulus value (red) x E
11 -- Y -- Spectral Tristimulus value (green) x E
12 -- Z -- Spectral Tristimulus value (blue) x E
13 -- P₄₄₅ -- Dartnall Nomogram Absorption Coefficient for Blue x E
14 -- P₅₃₅ -- Dartnall Nomogram Absorption Coefficient for Green x E
15 -- P₅₇₅ -- Dartnall Nomogram Absorption Coefficient for Red x E
16 -- FT1 -- First Filter Transmission
17 -- FT2 -- Second Filter Transmission
18 -- FT3 -- Third Filter Transmission or both filters in conjunction
if only two filters are used.
20 -- L_e -- Spectral Radiance
21 -- L_b -- Spectral Blue Light Radiance
22 -- CF -- Calibration Deck

(e) Column Eight. If part or all of the data has been found in error after the cards are punched or if certain distance factors, etc., are desired to be inserted into the computer program, a general function may be used to modify the source spectrum. If a general function is to be used, place a 1 in Column 8. The general function is described in paragraph 2g.

(f) Column 9. The function described in (d) above may be plotted if desired by placing a 1 in this column.

(g) Column 10. Any one of six input decks may be stored onto a permanent file by specifying the deck according to the following code in this column, and specifying the element name in the runstream deck. The data are stored in computed form regardless of its input configuration.

- ((1)) Use blank for None
- ((2)) Use 1 for Filter 1
- ((3)) Use 2 for Filter 2
- ((4)) Use 3 for Filter 3
- ((5)) Use 4 for Source (Event)

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

((6)) Use 5 for Calibration

((7)) Use 6 for Standard Lamp

(h) Column 11. The input data may be interpolated to 5-nm intervals if all or part of the data is provided less frequently. Interpolated values are marked with an asterick (*). A "1" in this column indicates that interpolation is desired.

(i) Column 12. The plot of spectral irradiance may be suppressed if this information is already known. A "1" in this column will eliminate the plot of spectral irradiance without inhibiting the filter or special function plots.

(j) Column 13. The spectral plots may be plotted on a linear scale, log scale, or both. The following codes may be used in this column.

((1)) Both -- Ø

((2)) Linear -- 1

((3)) Log -- 2

(k) Column 14. The spectral data table may be suppressed by entering a "1" in this column.

(5) Distance Factor Card. Two values to correct the calibration deck (DFU and DFV) may be entered on this card in the first two positions. The quantity DFU is used in the ultraviolet portion of the deck (200-400 nm), the quantity DFV is used in the visible and infrared portion. The calibration values in these two portions of the deck are multiplied by either DFU or DFV. If no correction for distance is necessary, these positions may be left blank. The next five positions contain the values of BANPAS(1), BWAV1, BANPAS(2), BWAV2, BANPAS(3). These values represent the band pass of the monochromator over certain wavelength regions. Default values are assigned as shown below:

(a) BANPAS(1) = 3 nm

(b) BWAV1 = 400 nm

(c) BANPAS(2) = 5nm

(d) BWAV2 = 700 nm

(e) BANPAS(3) = 10 nm

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

(6) Check List. Be sure all listed information is submitted either on or with the cover sheet.

b. Source Data. These data may be either spectral irradiance values or instrument readings which will yield spectral irradiance values when the calibration factors, distance factors and general functions are applied. This information is composed of the following six parts and should be entered on HSE-RL Form 90-1 (Figure C-2), and HSE-RL Form 90-2 (Figure C-3) may be used if more space is needed.

(1) Event. The event is used to distinguish between several source spectrums entered under the same cover sheet. The event name should be kept under 12 characters. Additional information, if needed, may be placed free format on a card between the event card and solid angle card. If the event is entered as "NEXT," the program will cycle to the beginning and all data must be repeated. If the same calibration deck should be used for the "NEXT" cycle, enter a card with "SAME" in the first four columns of the calibration header card and eliminate the rest of the calibration deck.

(2) Source Solid Angle. The solid angle of the source must be entered in exponential notation (example 1.00E-05). If the solid angle is not known, an approximation must be used.

(3) Data Values. Values are entered in integer form for wavelength and exponential form for instrument reading. The wavelength values must be placed in the rightmost columns (235 not 235). All wavelength values must be placed in ascending order. Values not in the proper order or duplicated will be disregarded by the computer and printed on the output as such. Data entries which exceed the last calibration entry will be disregarded. Data values before the first calibration entry will be set to zero.

(4) Spectral Peaks. Spectral peaks may be identified to the right of the instrument readings by inserting the word "PEAK" in the indicated columns. These values are then treated separately by the computer program. The peak readings are treated as extremely narrow spectral lines emitted by the source. Therefore, the bandpass of the monochromator determines the width of the instrument reading. The bandpass values are defined in the computer program as 3 nm in the ultraviolet (200-400 nm), 5 nm in the visible (400-700 nm) and 10 nm in the infrared (greater than 700 nm). These values may be changed by entering values on the distance factor card. Any background emission should be subtracted from "PEAK" values. A spectral peak may have the same wavelength as a continuum value. The cards must be placed in ascending wavelength order for input. However, these values will be printed at the end of the spectral data for output. These peaks will also be added to the proper interval in the histogram output. *For the computer program to calculate correctly, the first or last entry of the source*

HSE-RL/WP Technical Guide Hazard Analysis of Broad-Band Optical Sources

HSE-RL Form 90-1, 1 Jun 80

Hazards Analysis of Broad-Band Optical Sources (Tech Guide)

Replaces USAEHA Form 168-2, 1 Feb 79, which will be used.

FIGURE C-2. Source Data Sheet

HSE-RL/WP Technical Guide Hazard Analysis of Broad-Band Optical Sources

HSE-RL Form 90-2, 1 Jun 80

Hazard Analysis of Broad-Band Optical Sources (Tech Guide)

Replaces USAEHA Form 168-3, 1 Feb 79, which will be used.

FIGURE C-3. Source Data Continuation Sheet

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

spectrum must not be a "PEAK" value. Also, two peak readings must not be entered in sequence. In addition wavelengths on either side of the peak value must not include a contribution from the spectral line. Data readings within the bandpass of the monochromator on either side of the spectral line must be reduced to background levels.

(5) Distance. This value is the distance in centimeters that the source was from the detector during measurement. This value should be entered in columns 27 through 29 of the event card (format A3).

(6) Figure Number. The figure number of the histogram(s) associated with the source is entered in columns 20 and 21 of the event card (format A2). Only one figure number is assigned per source.

(7) Blackbody Data. A blackbody source with a specific temperature may be evaluated. To evaluate a blackbody source, the event card must read "BLACK," in the first six spaces; the next six contain the temperature in Kelvin; the next two spaces contain the letters, "BB." The solid angle is then read in as usual. The third card is the blackbody temperature in Kelvin with the format (F6.0). The rest of the source data is then omitted including the end card.

c. Calibration Data. The calibration deck is used to compute spectral irradiance from instrument readings. Since most photo detectors do not have a flat response, a different calibration factor is needed for each wavelength for which data are taken. If, however, calibration factors are given less frequently than spectral readings, the computer program will interpolate the calibration deck. The spectral readings will be truncated, however, at the end of the calibration values. The first card of the calibration deck is the distance factor card and the second is an identification card. A complete description of the calibration deck should be placed on this card including the serial numbers of the instruments and the standard lamp(s) used. The calibration deck may be submitted in seven ways as listed below. HSE-RL Form 90-3 (Figure C-4) should be used for this purpose.

(1) None Needed. Spectral irradiance may be submitted directly to the computer if known. In this situation the computer creates a calibration deck of all 1's by wavelength. A "2" is placed in column five if no calibration deck is used.

(2) Uncomputed One Deck. The computer will calculate calibration values if desired. The standard lamp spectrum with header and end cards should be punched on a deck and entered after the instrument readings from the standard lamp. Calibration factors are then calculated by dividing the instrument readings by the spectral irradiance for each wavelength. These two decks must correspond exactly by wavelength and wavelength interval.

HSE-RL Form 90-3, 1 Jul 80

Hazard Analysis of Broad-Band Optical Sources (Tech Guide)

Replaces USAEHA Form 168-4, 1 Feb 79, which will be used.

FIGURE C-4. Calibration Form

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

Spectral irradiance is calculated by dividing the instrument reading by the calibration factor. Column five is left blank or zero if this is the case.

(3) Uncomputed - Two Decks. Four decks of data complete with header and end cards are actually involved in this calculation. These consist of two sets of raw spectral readings from a standard lamp followed by the spectral irradiance of the lamp. An overlap region is possible between the ultraviolet portion of the spectrum and visible portion of the spectrum. The value BWAV1 determines at which point calibration values from the second deck are used.

(4) Uncomputed - Three Decks. Six decks of data are involved with this calculation. Calibration values are computed from instrument readings and standard lamp data over three spectral regions. Overlap is permitted between UV and visible and also between visible and infrared. These overlaps are eliminated before actual computation starts by the use of the values BWAV1 and BWAV2.

(5) Computed - One Deck. One deck is submitted by wavelength and calibration factor spectral irradiance is calculated by dividing the instrument reading by the calibration factor.

(6) Computed - Two Decks. Two decks complete with header and end cards cover the UV and visible spectrum. An overlap region is permitted between UV and visible which is eliminated by the factor BWAV1 during actual computation.

(7) Computed - Three Decks. Three decks with header and end cards make up this calibration. An overlap between UV and visible and one between visible and IR are eliminated before actual computation by the factors BWAV1 and BWAV2 which determine the point at which calibration decks are switched.

d. Standard Lamp. The spectral irradiance of the standard lamp in $\text{W}/(\text{cm}^2 \cdot \text{nm})$ must be submitted as a deck if it is desired that the computer calculate calibration values. HSE-RL Form 90-3 should be used for this purpose. The spectral irradiance wavelength values must correspond exactly with the uncomputed calibration wavelength values. A header card and end card must be used with this deck.

e. Biological Data. All biological data except for the first eight functions listed in Table, Appendix B, may be coded by the use of HSE-RL Form 90-3. The first eight functions are read in by wavelength with the format (F4.0, 8E9.2). *No header cards are used for biological information.* An end card must be placed at the end of each function entered.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

f. Filter Data. Up to three filters may be submitted with the source spectrum. HSE-RL Form 90-3 should be used to code this information. The filters may be identified by the use of the header card. An end card should also be used. The filters are referred to as filter 1, filter 2 or filter 3 (or FT1, FT2 or FT3) in the computer program. The filters must be placed in the proper order in the runstream. Transmission values lower than can be reasonably measured should not be entered on the coding forms at all unless such a region occurs in between two areas of interest. In which case zero should be entered or a reasonable approximation should be used. All transmission values for wavelengths less than the starting wavelength of the filter deck are assumed to be zero. Likewise, all values greater than the ending wavelength are assumed to be zero. Unmeasurable values (zero values) in between actual transmission values are treated as zero during calculation; but for the histogram plot, the spectral irradiance for these wavelengths is assigned the value of the lowest spectral irradiance through the filter in excess of 10^{-20} lowered to the nearest decade. This decade also is the lowest decade on the plot. Filter data may be entered in two formats.

(1) One method is to enter the data by wavelength and transmitted fraction. In this case NOCOF1, NOCOF2 or NOCOF3 should be set to "1" on the calculation control card.

(2) The second method is to record the instrument readings through the filter from an arbitrary light source in the first column after the wavelength. Instrument readings from the light source without the filter are then placed in the second column after the wavelength. In this case NOCOF1, NOCOF2 or NOCOF3 should be set to "2" on the calculation control card.

g. General Function. Part of the source data may be corrected if found faulty after the cards have been punched. The deck may be corrected throughout certain wavelength regions by the use of this function. The starting wavelength, the ending wavelength, and the correction factor are coded on HSE-RL Form 90-4 (Figure C-5). As many correction cards as needed may be used. An "END" card must be placed at the end of this function, as with any other deck. However, no header card is used with the general function.

3. KEYPUNCH INSTRUCTIONS.

a. Cover Sheet, Figure C-1. The following cards must be punched.

(1) First source description card (free format).

(2) Second source description card (free format). This card is optional. A blank card must not be used.

HSE-RL Form 90-4, 1 Sep 81

Hazard Analysis of Broad-Band Optical Sources (Tech Guide)

Replaces USAEHA Form 168-5, 1 Feb 79, which will be used.

FIGURE C-5. General Function Form

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

(3) Calculation control card - first 14 columns punched with the following acceptable characters.

- (a) Blank
- (b) Numbers (0 - 9)

(4) Distance factor card - format (7F4.0) (blank card is used if left blank on cover sheet).

b. Calibration Deck. If the calibration deck is noted on the cover sheet as being "ON FILE," the following card should be punched and inserted in the runstream in place of the calibration deck.

@ADD LM\$LMDSWP.element

The element of the file indicated as element above must be punched as provided on the cover sheet.

c. Deck Stored. If a deck is to be stored as marked on the cover sheet by element name, punch the following cards:

```
@ED,U      TEMP.,LM$LMDSWP.element  
EXIT  
@COPY,S    LM$LMDSWP.element,LM$LMDSWP.element  
@PACK     LM$LMDSWP.
```

where element is obtained from the cover sheet. These cards must be inserted into the runstream just before the @FIN card.

d. Data. The source data are given by wavelength which acts as a sequence number in the first four columns. These numbers should increase fairly uniformly usually in steps of 5 or 10. The second column of data should have numbers before the period, between the period and the "E-", and after the "E-." Incomplete entries should not be punched. Partially completed entries should be brought to the attention of the requestor unless the information is part of the form. Numbers to the right of the "E-" should not change by more than one between consecutive entries unless indicated by "PEAK" in third column. A change greater than one indicates a data error and should be noted on the cover sheet. A number greater than 12 also indicates a probable error.

e. Header Cards. Header cards are generally free format except that the first six columns are used for identification on filter decks. Therefore, a code should be punched in the first six columns (supplied by the requestor). The rest of the information should start in column 7 or after.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

f. End Cards. An end card (END in first three columns) should be placed at the end of each deck even if the requestor forgets to include it.

4. ASSEMBLYING THE RUN DECK.

a. Runstream Deck.

(1) Check that all files necessary for completion of run are assigned.

(2) Check that only one run is sent to the card reader at a time unless modifications are made in file names for plots.

(3) Check that the proper element name is used for storing the deck specified on the cover sheet.

b. Project Description. Check that one or two cards are used. A blank card may not be used for the second card. The second card must begin with non-numeric information when used.

c. Calculation Card. Check that all entries are numeric or blank.

d. Calibration Deck. Check that form matches that specified on calculation control card.

(1) None - 2 - No decks

(2) Uncomputed - One deck - 0 - Two decks complete with header and end cards. The standard lamp is the second deck.

(3) Uncomputed - Two decks - 3 - Four decks

(4) Uncomputed - Three decks - 5 - Six decks

(5) Computed - One deck - 1 - One deck

(6) Computed - Two decks - 4 - Two decks

(7) Computed - Three decks - 6 - Three decks

(8) Same - No decks - Uses calibration deck previously used in run stream.

e. Bio-Deck. Use @ADD card for this deck as shown below:

@ADD LM\$LMDSWP.DATA

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

f. Filter Decks.

- (1) Check that the form of all decks matches that specified on the calculation control card (two columns means two besides wavelength).
- (2) Check that a header and end card are present on each.
- (3) Check that the number of decks matches NUMFIL.

g. General Function. Check for end card but no header card. This function will usually be only one card besides end if used at all.

h. Source Decks.

- (1) Check for event and solid angle before data values begin. The solid angle may not be left blank or zero. An additional description card may be submitted between the event card and solid angle when desired.
- (2) Several decks may be stacked in the same run if the same filters and calibration are used.
- (3) If the word "NEXT" is used on the event card, the entire set of data beginning with the two description cards must be inserted after this card. New filter transmissions and calibration may then be submitted. If the same calibration deck is used, the word "SAME" may be entered on the header card, and the rest of the deck may be deleted.

i. Plot Deck. These two cards must be submitted unless no plot is desired.

j. Buffer Restraints.

(1) The buffer area for the plots fills after approximately 25 medium-sized histograms. When both a linear and logarithmic plot are provided for each event, only 12 events may be submitted in one runstream if no filters are used. Likewise for one filter, six events may be submitted. Only two events may be submitted when two or three filters are used.

(2) More events may be submitted in one runstream by plotting the data through the use of the plot deck and erasing the two plot files by the following card:

@ERS SWP200\$PLOT1., SWP200\$PLOT2.

The program may then be reexecuted by using the @XQT RK\$LMDSW2.SWP200 card and resubmitting all data.

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

(3) If the number of plots is limited through the use of variables FLPLOT, SUPRES, and LINLOG, more events may be run before the buffer area is filled.

5. MESSAGES/HALTS.

Messages

'CALIBRATION DATA NOT ENDED CORRECTLY'

'FILTER DATA WERE NOT ENDED CORRECTLY'

'GENERAL FUNCTION DOES NOT END CORRECTLY'

'SPECTRAL READINGS WERE NOT ENDED CORRECTLY'

Causes - Entire deck missing, no END card for data section, more than 340 cards in section or erroneous card(s) in deck. Card which was read instead of end card is printed to help identify cause.

Message

'BIODECK HAS NO END CARD AT IMAGE 1'

Causes - The @ADD LM\$LMDSWP.DATA card was omitted from runstream (or mislocated) or the calibration deck does not match the calculation control card.

Effect on program - Print error message and abort run.

Action - Insert @ADD card or correct calculation control card.

Message

'BIODECK HAS NO END CARD AT IMAGE XXX'

Effect on program - Print error message and abort.

Action - Correct biodeck or check sequence of runstream.

Effect on program - Print error message and abort run.

Action - Insert deck or END card at end of appropriate section; if END card is present, check spelling or sequence of decks, or remove extra cards and rerun.

Message

'WAVELENGTH XXXX OF SPECTRAL IRRADIANCES DOES NOT MATCH WAVELENGTH OF READING FOR CALIBRATION FACTOR'

Cause - As in message for uncomputed calibration.

Effect on program - Print error message and abort run.

Action - Correct errors on data cards and rerun.

Message

'DIVISION BY ZERO IN CALIBRATION FACTOR SECTION AT WAVELENGTH XXXX'

Cause - Datum in second set of raw calibration data is zero.

Effect on program - Print error message and abort run.

Action - Correct error on data card and rerun.

Message

HSE-RL/WP Technical Guide
Hazard Analysis of Broad-Band Optical Sources

'CALIBRATION FACTOR ERROR-NUMBER RAW DATA NOT MATCHED'

Cause - Second set of raw calibration data has different number of items than first set.

Effect on program - Print error message and abort.

Action - Insert missing data and rerun.

Message

'ATTEMPT TO DIVIDE A CALIBRATION FACTOR OF ZERO INTO ADJUSTED INSTRUMENT READING AT WAVELENGTH XXXX'

Cause - First set of raw calibration data contains a zero.

Effect on program - Print error message and abort.

Action - Change zero to valid value and rerun.

Message

'SOURCE DATUM DISREGARDED XXXX XXXXXXXXXX'

Cause - Duplicate wavelengths or calibration deck is too short.

Effect on Program - Delete cards and run.

Action - Eliminate data cards or amend calibration deck.

Message

'TWO PEAKS IN SEQUENCE OR SPECTRUM BEGINS WITH PEAK --- PROBABLE ERROR'

Cause - As in message.

Effect on program - Continues to run but with errors.

Action - Insert more continuum values in data.

Message

'INCORRECT GENERAL FUNCTION CARD'

Cause - Incorrect format or end card missing.

Effect on program - Print error message and abort.

Action - Correct card.

Message

'ERROR IN INTERP ROUTINE NEAR XXXX XXXX XXXX XXXX'

Cause - Division by zero in INTERP Subroutine.

Effect on program - Interpolated value is returned as zero.

Action - Correct spectral data. Spectral values where error occurred are printed.

Message

'ALL PROCESSING COMPLETED'

Cause - Normal completion of program.

Effect on program - Normal completion.

Action - None required.

APPENDIX D

 USEFUL CIE RADIOMETRIC AND PHOTOMETRIC TERMS AND UNITS^{1,2}

RADIOMETRIC				PHOTOMETRIC			
Term	Symbol	Defining Equation	SI Unit and Abbreviation	Term	Symbol	Defining Equation	SI Units and Abbreviation
Radiant Energy	Q_e		Joule (J)	Quantity of Light	Q_v	$Q_v = \int \Phi_v dt$	lumen-second (lm·s) (talbot)
Radiant Energy Density	W_e	$W_e = \frac{dQ_e}{dv}$	Joule per cubic meter ($J \cdot m^{-3}$)	Luminous Energy Density	W_v	$W_v = \frac{dQ_v}{dv}$	talbot per square meter ($lm \cdot s \cdot m^{-3}$)
Radiant Power (Radiant Flux)	Φ_e, P	$\Phi_e = \frac{d\Phi_e}{dt}$	Watt (W)	Luminous Flux	Φ_v	$\Phi_v = 680 \int \frac{d\Phi_e}{d\lambda} V(\lambda) d\lambda$	lumen (lm)
Radiant Exitance	M_e	$M_e = \frac{d\Phi_e}{dA} = \int L_e \cdot \cos\theta \cdot d\Omega$	Watt per square meter ($W \cdot m^{-2}$)	Luminous Exitance	M_v	$M_v = \frac{d\Phi_v}{dA} = \int L_v \cdot \cos\theta \cdot d\Omega$	lumen per square meter m^{-2}
Irradiance or Radiant Flux Density (Dose Rate in Photobiology)	E_e	$E_e = \frac{d\Phi_e}{dA}$	Watt per square meter ($W \cdot m^{-2}$)	Illuminance (luminous flux density)	E_v	$E_v = \frac{d\Phi_v}{dA}$	lumen per square meter ($lm \cdot m^{-2}$) lux (lx)
Radiant Intensity	I_e	$I_e = \frac{d\Phi_e}{d\Omega}$	Watt per steradian ($W \cdot sr^{-1}$)	Luminous Intensity (candlepower)	I_v	$I_v = \frac{d\Phi_v}{d\Omega}$	lumen per steradian (lm·sr) or candela (cd)
Radiance	L_e	$L_e = \frac{d^2\Phi_e}{d\Omega \cdot dA \cdot \cos\theta} S$	Watt per steradian and per square meter ($W \cdot sr^{-1} \cdot m^{-2}$)	Luminance	L_v	$L_v = \frac{d^2\Phi_v}{d\Omega \cdot dA \cdot \cos\theta} S$	candela per square meter ($cd \cdot m^{-2}$)
Radiant Exposure (Dose in Photobiology)	H_e	$H_e = \frac{dQ_e}{dA}$	Joule per square meter ($J \cdot m^{-2}$)	Light Exposure	H_v	$H_v = \frac{dQ_v}{dA} = \int E_v dt$	lux-second (lx·s)
				Luminous Efficacy (of radiation)	K	$K = \frac{\Phi_v}{\Phi_e}$	lumen per watt ($lm \cdot W^{-1}$)
				Luminous Efficiency (of a broad band radiation)	$V(*)$	$V(*) = \frac{K}{K_m} = \frac{K}{680}$	unitless
Radiant Efficiency ³ (of a source)	η_e	$\eta_e = \frac{P}{P_i}$	unitless	Luminous Efficacy ³ (of a source)	η_v	$\eta_v = \frac{\Phi_v}{P_i}$	lumen per watt ($lm \cdot W^{-1}$)
Optical Density ⁴	D_e	$D_e = -\log_{10} T_e$	unitless	Optical Density ⁴	D_v	$D_v = -\log_{10} T_v$	unitless
1. The units may be altered to refer to narrow spectral bands in which case the term is preceded by the word <i>spectral</i> , and the unit is then per wavelength interval and the symbol has a subscript λ . For example, spectral irradiance H_λ has units of $W \cdot m^{-2} \cdot m^{-1}$ or more often, $W \cdot cm^{-2} \cdot nm^{-1}$.				Retinal Illuminance in Trolands	E_t	$E_t = \frac{L_v}{S_p}$	troland (td) = luminance in $cd \cdot m^{-2}$ times pupil area in mm^2

1. The units may be altered to refer to narrow spectral bands in which case the term is preceded by the word *spectral*, and the unit is then per wavelength interval and the symbol has a subscript λ . For example, spectral irradiance H_λ has units of $W \cdot m^{-2} \cdot m^{-1}$ or more often, $W \cdot cm^{-2} \cdot nm^{-1}$.
2. While the meter is the preferred unit of length, the centimeter is still the most commonly used unit of length for many of the above terms and the mm or μm are most commonly used to express wavelength.

3. P_i is electrical input power in watts.

4. T is the transmission

5. At the source $L = \frac{dI}{dA \cdot \cos\theta}$ and at a receptor $L = \frac{dI}{d\Omega}$